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The AUTOMOBILE

Exhaust Gas Analysis for Economy

Valuable Data Secured in Tests Made by THE AUTOMOBILE

Part I

¶No more useful test of a gasoline motor and its carbureter can be made than a careful analysis of the exhaust gases under varying conditions of running. Realizing the immense value of comparative figures obtained from such tests THE AUTOMOBILE *has conducted a series of exhaust gas tests from a large number of cars and trucks under widely varying speeds and loads. The tests were made by W. C. Marshall, prominent in engineering circles, accompanied by a member of our staff as observer. Fifteen machines, twelve passenger cars and three trucks, were put under trial. Part II, comprising the report by Herbert Chase, Laboratory Engineer of the Automobile Club of America, begins this week. Next week this report will be continued with a table giving the complete results of the tests.*

ONE of the results of the high prices now obtaining in the gasoline market has been to stimulate interest in the economical running of the automobile engine. Strong efforts are being made among the manufacturers and designers to discover means by which the already efficient carbureter and its equipment may be brought to a still higher degree of efficiency, and so lessen the running cost of the car.

Although a solution to this problem of the running cost does not necessarily lie solely in better methods of carburetion it is nevertheless generally felt that there is more room for development in that direction than in the engine iteslf. In any case, one of the most useful tests to point the direction in which improvement is possible is that of exhaust gas analysis.

In exhaustive tests conducted by THE AUTOMOBILE samples of gas were taken from fifteen cars and trucks, the features of which have all been noted so that they can be taken into account when comparing the performances of the different automobiles tested.

All pleasure cars were fitted with a top which was down during the test. Windshields were half raised in all cases, with the single exception of car No. 10 which was without this fitting.

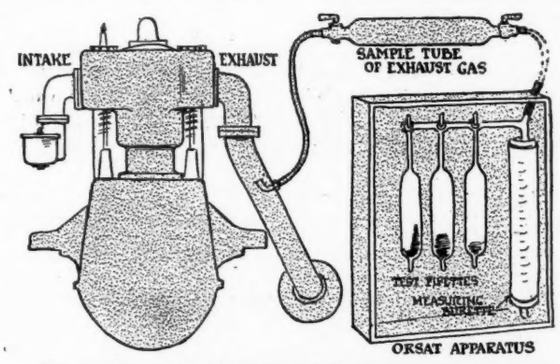


Fig. 1—Method of taking sample of exhaust gas by means of a small scoop inserted in the exhaust pipe. The sample tube is a plain container provided with stopcocks. These cocks are allowed to remain open until a particular running condition is obtained, when they are quickly closed, confining the sample, which is then analyzed in the Orsat apparatus shown at the right. The three pipettes in this apparatus contain different reagents which absorb certain constituents of the gas, the exact quantities being determined by the burette

The type of cars used is indicated in the table on page 396.

The gasoline used was the same in density for all the tests, its specific gravity being .722 and Beaumé hydrometer test .665,

A special graduated gasoline tank, shown in Figs. 2 and 3 was used, enabling the fuel consumption to be accurately measured. The tank itself A, of copper, measures about 4 inches in diameter. A glass tube G in direct communication with its interior was arranged alongside and served as a gauge by which the level of the gasoline could be observed on the scale marked on the wooden upright B. Each space *x* in this scale represents 1-10th of a gallon. Further graduations were provided in the form of teeth on the sliding piece F, so that the reading could be made to the nearest hundredth of a gallon. Connection to the carbureter was made through the rubber pipe E at the right. The whole was firmly mounted on a wooden base M by which the apparatus could be clamped to the floorboard during a test.

The pipe line of the car was disconnected either at the carbureter, gasoline tank outlet, or strainer. In the first case a new pipe was run from the carbureter to a point between the front seat and the dash, and connected to the graduated tank by

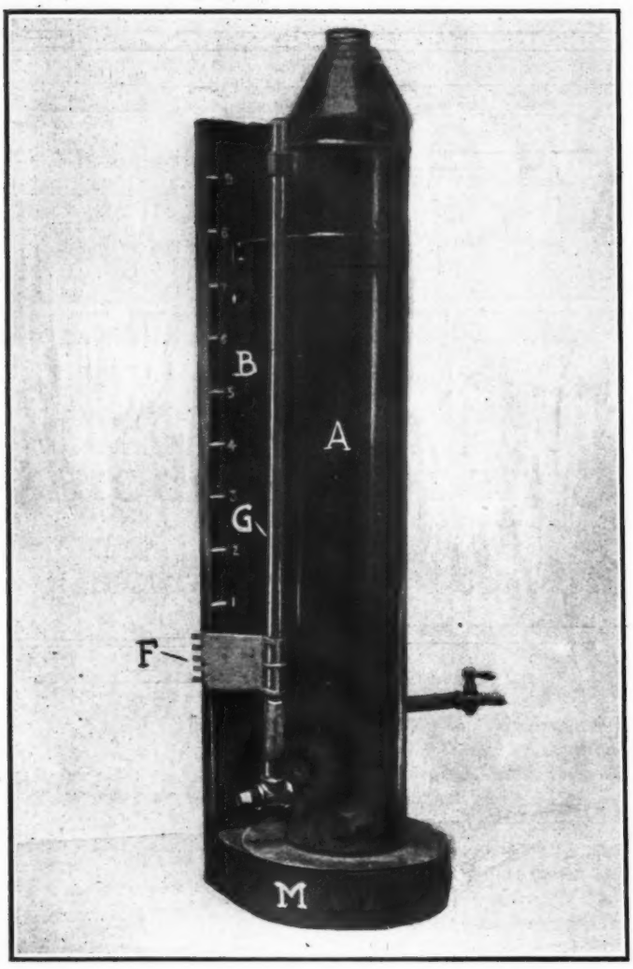


Fig. 2—Graduated gasoline tank with vernier attachment used throughout all the tests to obtain fuel consumption

the rubber tube E. In the other cases the rubber tube was slipped over the detached end of the existing pipe.

The gasoline measurements at the various points throughout the route are included in the tables.

The sample of exhaust gas from the motor was taken from the exhaust pipe at a distance from the exhaust manifold varying from 1 to 3 feet. A hole was drilled in the exhaust pipe D, Fig. 7 and threaded to take a .25 inch pipe thread. Into this hole was

Passenger Cars Used in Exhaust Gas Tests

Car No.	Description	
1	5-passenger touring car	1912
2	7-passenger touring car	1912
3	5-passenger toy tonneau	1910
4	4-passenger body	1909
5	5-passenger touring body	1911
6	7-passenger touring body	1910
7	7-passenger touring body	1912
8	2-passenger runabout body	1911
9	5-passenger toy tonneau body	1912
10	5-passenger toy tonneau body	1910
11	7-passenger touring tonneau body	1910
12	5-passenger touring tonneau body	1912
	Trucks	
13	5-ton truck	1912
14	3½-ton truck chassis	1912
15	3½-ton truck	....

screwed a brass coupling A which had been bored out to allow a copper tube .3125 inch diameter to pass freely through it. The copper tube B was bent and slightly expanded at the end inside the exhaust pipe, and was pointed towards the motor to catch the flowing gas. When once placed in its proper position, the nut C was screwed on the end of the coupling A which firmly held the pipe from turning.

The gas passed through the pipe B to a tube E to which it was connected by a short rubber tube F. The sampling tube was supported on a stand clamped to the running board of the car. The gas was allowed to blow through the tube for some minutes by opening all the cocks. When cleared of air the cocks were closed, and the tube removed.

Motor Conditions During Tests

Nine samples were taken from each of the pleasure cars and eight from each truck. The conditions of motor performance during the taking of the samples on the pleasure cars were as follows:

1. Car standing after motor had been running (motor running at low speed.)
2. When car was accelerating to 10 m.p.h. from stand.
3. Car running 10 m.p.h. on level on 2nd or 3rd speed.
4. Car running 15 m.p.h. on level on top speed.
5. Car running 20 m.p.h. on level on top speed.
6. Car running 30 m.p.h. on level on top speed.
7. Car climbing 6% gradient at 20 m.p.h. on top speed.
8. Car climbing 5.75% gradient at 20 m.p.h. on 2nd or 3rd.
9. Car climbing 12.5% gradient at 20 m.p.h. on 2nd or 3rd.

The road surface while taking samples 3 to 6 was wooden block. Sample 7 was taken on oiled macadam (Riverdale avenue Hill), 8 on smooth wood block (St. Nicholas avenue at 187th-190th streets), and 9 while travelling over Belgian block (Fort George Hill).

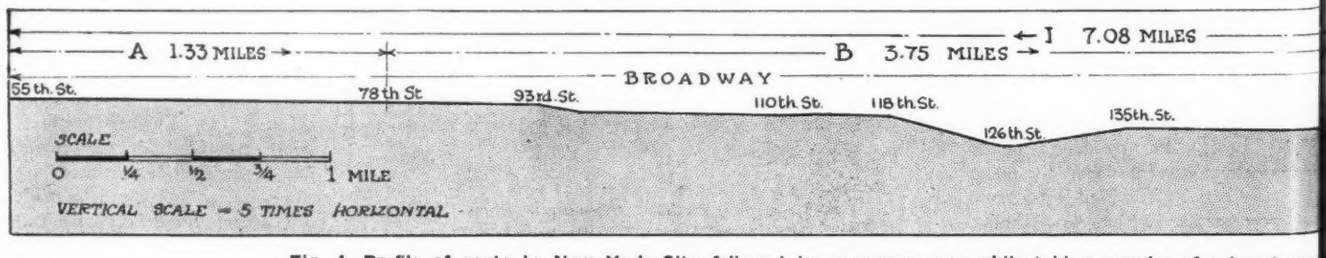


Fig. 4—Profile of route in New York City followed by passenger cars while taking samples of exhaust gas

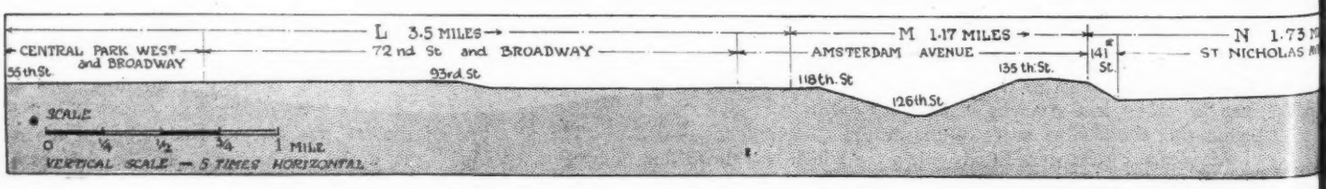


Fig. 5—Profile of the truck route from the Fifty-fifth street entrance of the Automobile Club northward and ret

Both throttle and spark lever positions were noted throughout the tests.

The samples from the truck motors were taken under the following conditions:

1. Car standing after running, motor running.
2. Accelerating from stand to maximum speed.
3. Maximum speed on high gear.
4. Maximum speed on 2nd gear.
5. Climbing 1% grade on high gear.
6. Climbing 8% grade on 2nd gear.
7. Maximum speed over long 1% incline on high gear.
8. Climbing 12% grade.

All the truck samples were taken on a road surface of asphalt or wood, excepting samples 6 and 8 which were taken on Belgian block.

Route Followed in Test

The route covered during the tests for pleasure cars, indicated by the dotted line on the map Fig. 8, was from the Fifty-fifth street entrance of the Automobile Club of America to Broadway, north on Broadway to its intersection with Saint Nicholas avenue at 168th street, then north on Saint Nicholas avenue to top of Fort George Hill, down this hill to Dyckman street, then north under the Interborough tracks via Nagle avenue and Tenth avenue to 230th street and up Riverdale avenue to the top of the ridge. The police sentry box at the top of this hill was the northern end of the route. Return was made to Fifty-fifth street over the same route.

Gasoline and odometer readings were taken at the following points (marked A to G on the chart, Fig. 4): Fifty-fiftth street entrance of the A. C. A., Seventy-eighth street on Broadway, Dyckman street, 215th street, foot of hill on Riverdale avenue and top of hill at police box. Returning, readings were taken at police box, Dyckman street, and top of Fort George Hill (193rd street).

The route covered by the trucks can be followed by reference to the map, Fig. 8, where the solid black lines with small arrows represent the deviations made by the trucks from the Broadway route. No truck was taken north of 165th street, at which point a return was made. The truck route from its commencement at Fifty-fifth street was as follows: Fifty-fifth street up Central Park West to Seventy-second street, turning here into Broadway and proceeding north on Broadway to 116th street, then over to Amsterdam avenue and north to 141st street turning into Staint Nicholas avenue, up to 165th street, then south on Broadway to 129th street ascending hill at 130th street ferry to Riverside Drive, to 122nd street, into Broadway and south to the starting point (A. C. A.).

Gasoline and odometer measurements were taken at the start, 116th street, 135th street, 165th street, foot of hill near 130th street ferry, at Riverside Drive corner of 112th street and finish.

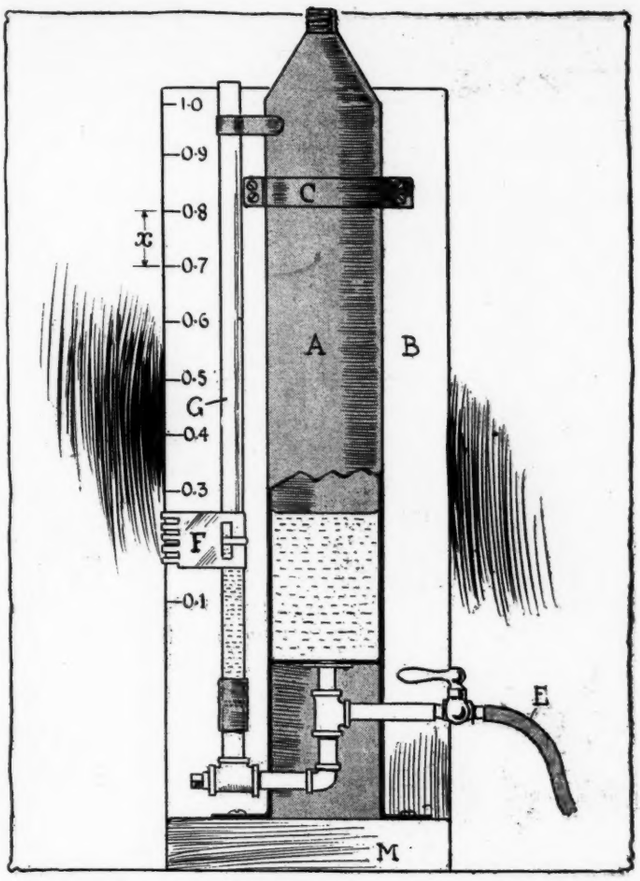


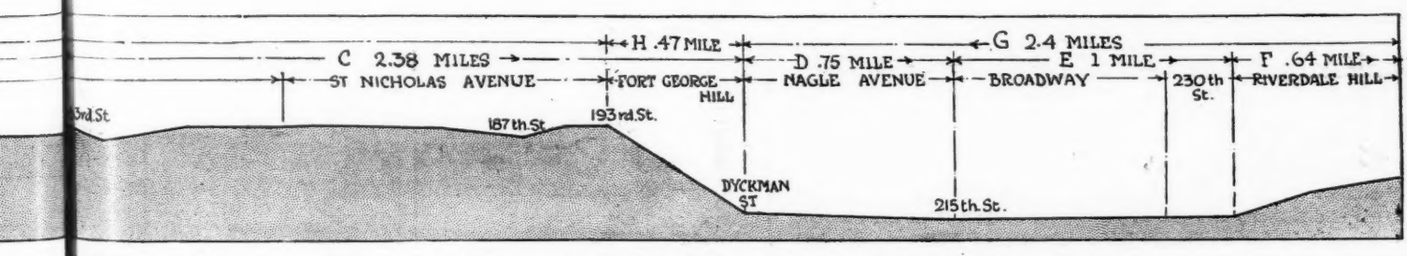
Fig. 3—Section of graduated tank showing attachment of sight-level tube and connection for carbureter

Figs. 4 and 5 show the profiles of pleasure car and truck routes respectively.

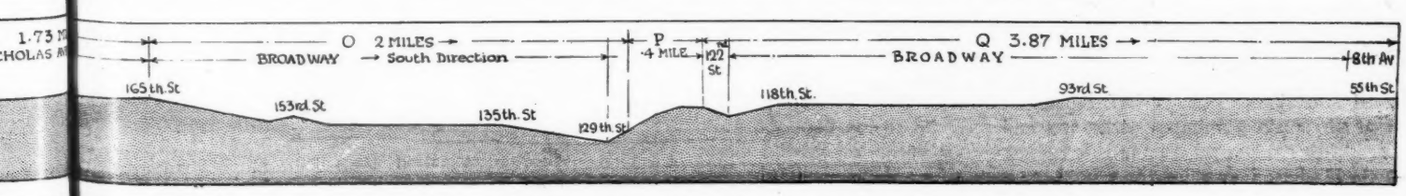
Exhaust gas samples were taken at the various points indicated on the map, Fig. 8.

After the samples were taken on each car the containing tubes were transferred to the laboratory, where each was analyzed in turn on the Orsat apparatus shown in Fig. 6 to determine the percentages of carbon dioxide (CO_2), carbon monoxide (CO) and oxygen present.

Before transferring the gas to the Orsat apparatus, one end of the brass tube containing it was filled with water to force out



ters A to G indicate the distances run between each point at which gasoline and odometer readings were made



oline readings were made at the points indicated. The distances are given after the reference letters P to Q

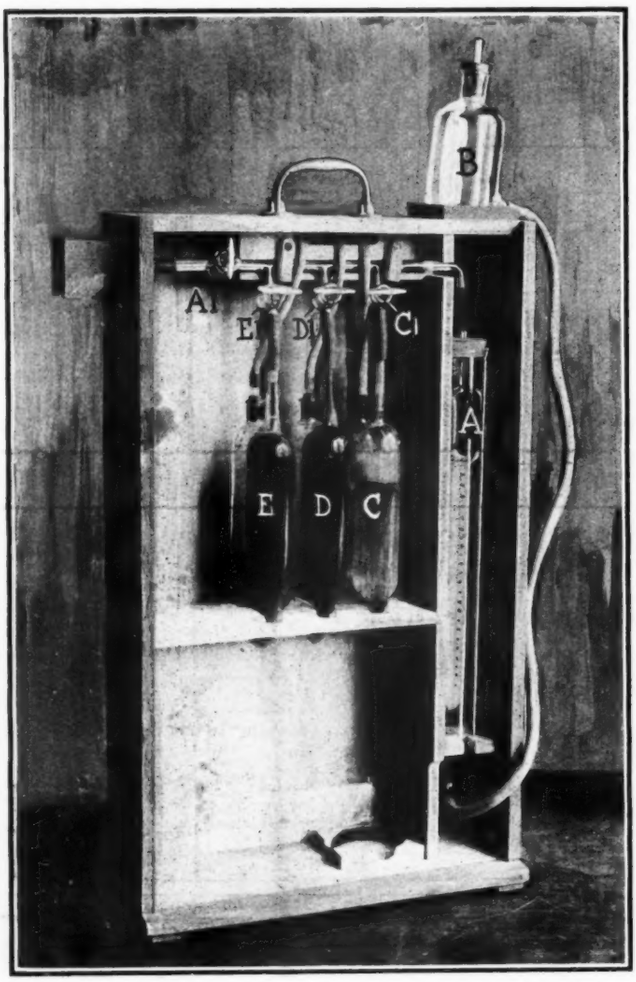


Fig. 6—Orsat apparatus for analyzing exhaust gases. The gas is passed in at the upper left corner and is measured in the burette A. The three pipettes E D and C contain reagents which are brought into contact with the gas, absorbing certain constituents

the air in the portion outside the cock. The presence of this air during the test would of course be detrimental to the analysis. A rubber tube filled with water from a tank was then slipped over this end, and the gas forced out of the tube into the Orsat burette by water pressure from the tank. Before doing so, the air in the end of the gas tube connected to the Orsat manifold was forced out into the burette by the water pressure and discharged from the apparatus.

The Orsat appartus used was of the three-pipette type. The burette A, Fig. 6, is filled with the gas to be analyzed by lowering the leveling bottle B and opening the stopcock A1 where the gas enters by a connection through the side of the box. The stopcock A1 is then closed, the leveling bottle raised and cock C1 opened until the water rises in the burette to the mark at the top, thus forcing the gas into pipette C. The stopcock C1 is then closed and the gas allowed to remain in contact with the reagent in this pipette for 3 minutes for absorption of CO_2. At the end of this time the leveling bottle is again lowered, stopcock C1 opened, permitting the gas to return to the burette until the solution in pipette C has risen to the height of the mark at the neck. The diminution in volume of the gas is then read by means of the graduations on the burette B. The gas is then forced into pipette D in a similar manner through cock D1, allowed to remain 3 minutes, as before, and returned to the burette. After reading its volume it is passed through cock E1 into pipette E where it remains for a further period of 3 minutes, and is then returned to the burette, read, and finally discharged.

What Carburetion Is

Requirements for Perfect Combustion in a Gasoline Motor—Utilizing All the Energy of the Fuel

Part II

By Herbert Chase

Laboratory Engineer of the Automobile Club of America

THE fuel used in automobile engines is a hydrocarbon or really a combination of several hydrocarbons forming part of what is known as the paraffin series. These liquid distillates obtained from crude petroleum have the general chemical formula C_nH_{2n+2} which may be explained as a substance composed of n molecules of carbon and $2n+2$ molecules of hydrogen. Gasoline, for example, is composed largely of hexane which contains six molecules of carbon, namely, $n=6$ combined with $2\times6+2=14$ molecules of hydrogen — C_6H_{14}.

The term combustion may be defined as the union of a substance with oxygen. Both hydrogen and carbon, when raised to the required temperature, in the presence of air unite very readily with the oxygen in the air, the hydrogen turning to water and the carbon to carbon-dioxide CO_2 when the proper quantity of air is present, or to carbon monoxide, CO, when there is insufficient air for complete combustion. A hydrocarbon is, there-

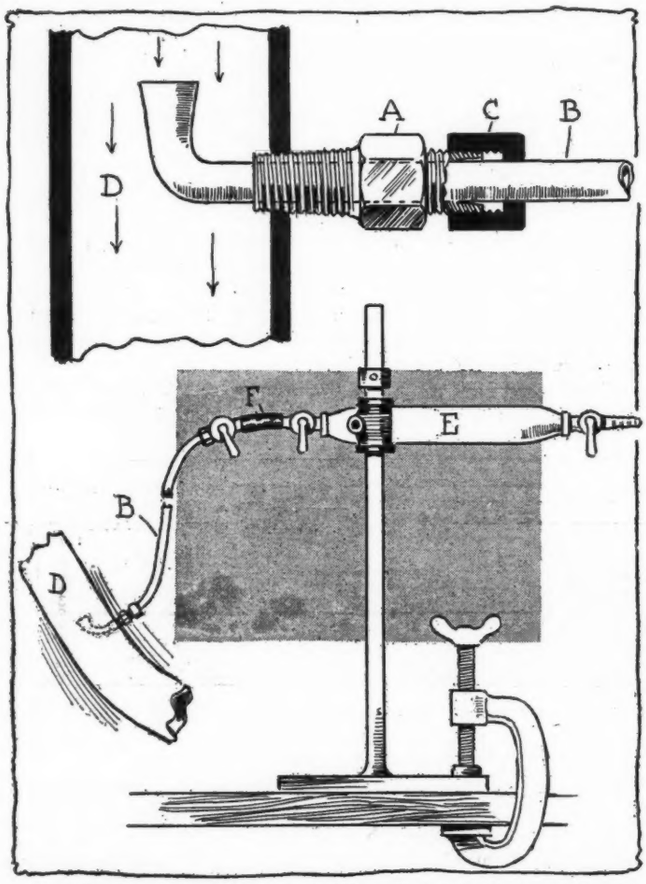


Fig. 7—Showing method of collecting gas sample by means of bent scoop inserted in the exhaust pipe in the path of the gases. Below, the sample tube supported on stand

fore, an excellent fuel particularly when in a gaseous state or when in such state as to be easily and quickly converted into a gas.

The function of a carbureter is to mix the fuel with the proper quantity of air and to assist so far as possible the volatilization of the liquid, namely, the conversion of liquid fuel into the gaseous state.

In considering the action which takes place in an engine cylinder it is imperative that we keep in mind the fact that the interval of time during which a single charge of gas may burn, expand and do work is very short. In a four-cycle motor running even as slowly as 300 revolutions per minute this interval is but .1 second, while at 1,500 revolutions per minute it is but .02 second. Consequently whatever effective combustion takes place must occur within this brief space of time. Evidently, then, at least three conditions must obtain:

1—The fuel must be in a gaseous state.

2—The fuel must be thoroughly mixed with the air.

3—A sufficient quantity of air must be present to support combustion.

1—The first of these conditions can be met in only one way, namely, by supplying a sufficient amount of heat to convert the liquid fuel into a gas. Furthermore, this must be accomplished within a very limited time. Atomizing the fuel will materially assist but will not accomplish gasification any more than converting a jet of water into a very fine spray will turn it into steam. Spraying breaks up the fuel into small globules and thereby materially increases the surface exposed to the air or to whatever else the particles of fuel come into contact with. This assists the heating process, thereby greatly facilitating gasification as well as proper mixing of the gas with the necessary air.

2—Much, of course, depends upon the volatility of the fuel, namely, upon the quantity of heat and the temperature necessary to convert the fuel into a gas. Much of the gasoline now on the market contains a considerable percentage of heavy distillates which must be raised to a temperature of 225 deg. Fahr., or above, before they will change into the gaseous state. Hence the necessity of supplying both an adequate quantity and a sufficient degree of heat.

3—Now as to the proper quantity of air necessary to support the combustion and to render it most efficient. It is a well known fact that it takes a very appreciable length of time for a flame to spread or propagate itself throughout a mixture of gas and air and that the rate of propagation varies with the relative proportions of gas and air in the mixture. This rate of flame propagation is greatest when the proportion of air to gasoline is about 12.5 to 1, by weight, although the maximum thermal efficiency of the motor or the point at which the greatest proportion of heat

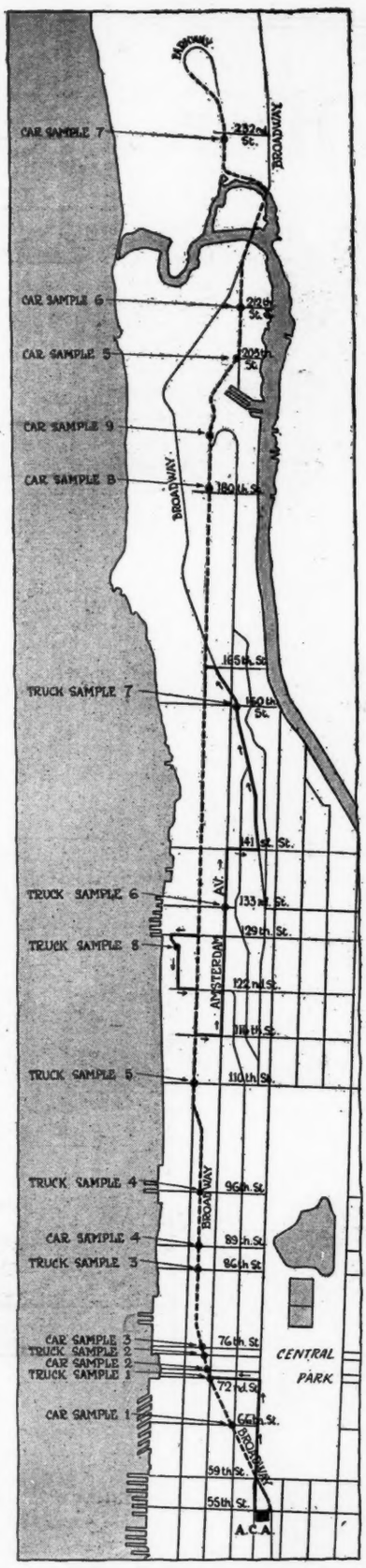


Fig. 8—Route followed during tests. The start was made from the Automobile C'ub of America, at Fifty-fifth street proceeding north and returning as shown

supplied is turned into useful work, is obtained with a ratio of about 17 parts of air to 1 of gas.

With this in mind let us assume that the gasoline is composed entirely of *hexane* and write a chemical equation which expresses substantially what takes place when combustion is complete, namely, when all the hydrogen and carbon are burned.

$$2\,C_6H_{14} + 19\,O_2 + 71.3\,N_2 = 12\,CO_2 + 14\,H_2O + 71.3\,N_2.$$

This equation does not represent exactly what happens, since gasoline seldom contains more than 85 or 90 per cent. of *hexane;* nor does it show any intermediate steps. It serves a useful purpose, nevertheless, especially when compared with a similar equation expressing an incomplete combustion and giving products in a proportion found very frequently in practice.

$$2\,C_6H_{14} + 17.5\,O_2 + 65.8\,N_2 = 9\,CO_2 + 3\,CO + 14\,H_2O + 65.8\,N_2.$$

This last equation shows an absolute and preventable loss of no less than 15 per cent. of the available energy in the fuel—a loss quite as real as that which would result if a leak in the gasoline tank permitted 1 1-2 out of every 10 gallons to run to waste.

Having now considered three factors which are essential, if complete and efficient combustion is to be effected, it will be useful, to mention some conditions which will tend to prevent perfect combustion. *One of the most serious of these is the tendency for gasoline vapor to condense in the inlet manifold particularly when the latter is cold or of such large size that the velocity of the mixture is low.*

The remedy for this is to reduce the size of the manifold as much as other considerations will permit and to keep it warm. A very weak, or too late a spark are factors which give rise to incomplete combustion particularly if the mixture is a slow burning one—which, of course, it should not be. Any tendency of a carbureter to flood is obviously objectionable, while the disadvantages of poorer grades of gasoline with their tendency to vaporize slowly when used in a carbureter intended only for the better and more volatile grades, should be readily apparent from the foregoing.

High back pressure in the exhaust line, particularly that caused by two cylinders exhausting at the same time into a common manifold is detrimental to proper functioning in many ways, but chiefly in operating to keep an unnecessarily large quantity of burned gases in the clearance space. These dead gases dilute the incoming charge, thereby making both ignition and combustion more difficult. The remedy is a muffler with negligible back pressure and a manifold so divided that the exhaust valves of no two cylinders are open into the same compartment at the same time, this latter precaution applying particularly to six-cylinder motors.

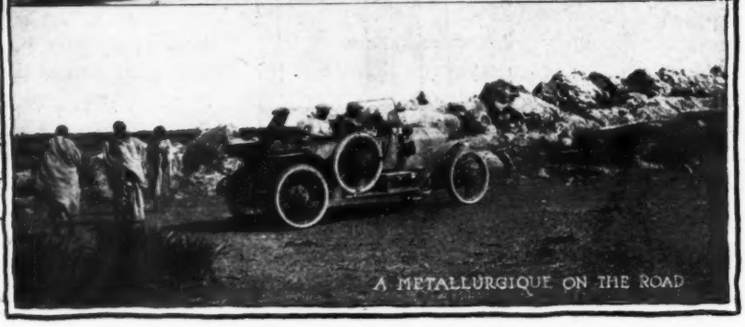
Morocco as a

DE DION BOUTON ON THE ROAD

A MOOR IS TAKEN A-BOARD TO SHOW THE WAY

LEISURELY METHOD OF ROAD BUILDING

MEETING A NATIVE CONVOY



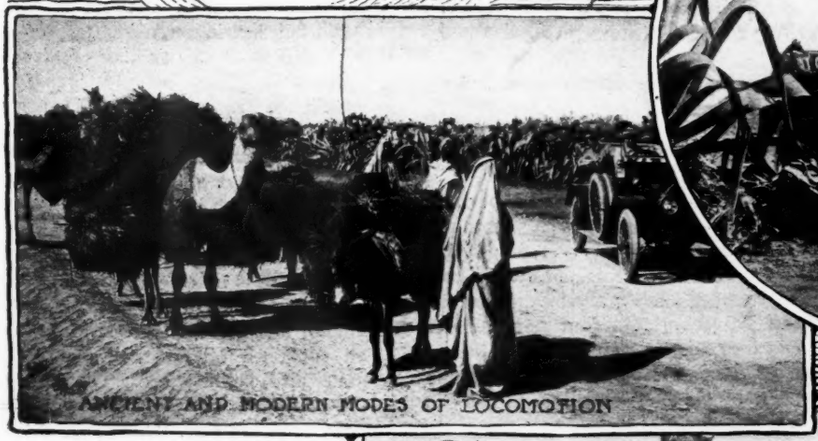
A METALLURGIQUE ON THE ROAD

MOROCCO does not yet figure on the guide books as a classified automobile touring ground. In consequence, the authorities of that wild country recently tried to make known the charms of their land by means of a reliability competition. Not much importance need be attached to the event as a technical demonstration, for the competitors were not numerous and the rules were not very strictly applied; but as a help in making known the land the tour was invaluable. The country is easily reached by steamers from Marseilles, and the contrast between touring conditions

Touring Ground

NATIVE TROOPS ARE INTERESTED IN THE AUTOMOBILE

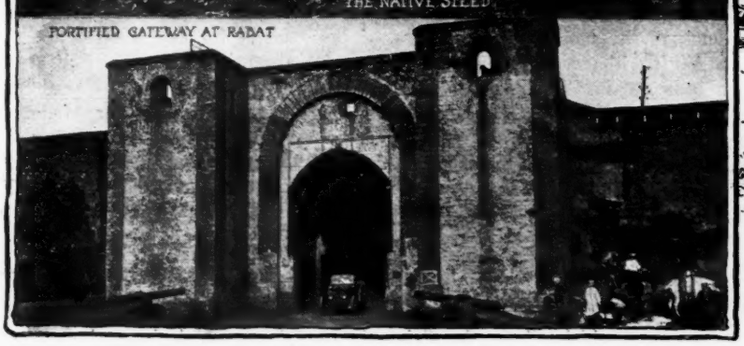
A DIFFICULT PASSAGE



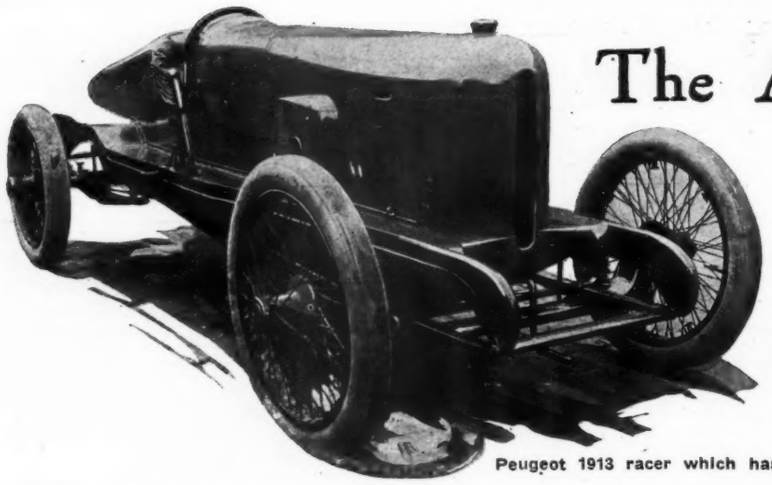
ANCIENT AND MODERN MODES OF LOCOMOTION

in any part of Europe and in this portion of Northern Africa is sufficiently great to satisfy the most experienced tourist. Obviously there is no comparison between the road surfaces of France and those of Morocco, but with an adequate clearance and an efficient cooling system a car is not restricted in its movements. As may be seen by the accompanying illustrations, to travel over this touring ground would be of interest to the most blasé There, indeed, is a country which will furnish the average tourist charms untold, filled as it is with the beautiful, the unusual and the picturesque.

THE NATIVE SLED



FORTIFIED GATEWAY AT RABAT



Peugeot 1913 racer which has been withdrawn from contests

The Acme of Racing Efficiency

1913 3-Liter Peugeot Has Long Stroke, Overhead Valves and Ball-Bearing Type Crankshaft

TO get 92 horsepower out of a four-cylinder motor of only 183 cubic inches cylinder volume, to attain a maximum speed of 95.07 miles a hour over the measured kilometer on an ordinary road, to put up an average of 93.82 miles an hour over the measured kilometer timed in both directions, to show an average of 63.2 miles an hour in a 388 miles road race over hilly country—such is the record of the 3-liter Peugeot, the most successful racing car of its class in the world, and doubtless the most efficient machine ever produced. The career of this car has come to an end, for it has been decided that the 3-liter racing class shall be replaced this year by 2.5-liter models. The racing cars have passed into the hands of private owners and with their retirement a description of their features becomes possible.

Limited to 183 cubic inches cylinder area and stroke bore ratio of 2 to 1, the Peugeot racing team adopted the longest possible stroke, and, it is worth noting, were the only cars in their class with the maximum stroke-bore ratio. The dimensions are 3.07 by 6.14 inches. As last year, the cylinders are a block casting of the shortest possible overall length, having four valves per cylinder mounted in the head and inclined 30 degrees from the vertical. A hemispheric combustion chamber is formed, the valves have the largest possible diameter and the valve operating mechanism is similar in design, but different in detail from that of the 1912 cars.

Features of Racing Peugeot

Horsepower	92 at 2,870 revs. per min.
Bore	3.07 inches
Stroke	6.14 inches
Stroke-Bore Ratio	2 to 1
Cylinder Volume	183 cu. in.
Overhead Valves	four per cylinder
Hemispherical combustion head	
Suspension; three-point in subframe	

Placed above each row of valves is an aluminum housing carrying a camshaft and valve tappet mechanism. Each housing is held down by a series of long bolts and is sufficiently removed from the cylinders to be practically isolated from their heat. By unscrewing eight nuts the complete camshaft, together with its housing, can be withdrawn. The operation of these camshafts is now by a train of spur pinions carried within an aluminum housing at the front end of the motor. On the cars of the previous year a vertical shaft with bevel gear was made use of, but better results have been obtained with spur pinions. Each gear wheel is mounted on a ball bearing. The new pushrod is an L-shaped piece with a projecting stem forming the actual pushrod. A light coil spring serves to keep the tappet in contact with the face of the cam. The combustion chamber is of such a shape that unless a valve broke quite close to the head it would be impossible for it to drop on the piston.

The pistons are of B.N.D. steel, machined out of the solid. The I-section connecting rods are also of B.N.D. steel, with the wrist pins fixed in them. This pin is carried in bronze sleeves in the piston wall, an arrangement which allows the wrist pin to obtain its lubrication directly from the walls of the cylinder.

Instead of the five plain bearing crankshaft used on the previous year's model, the main shaft has three S.R.O. ball bearings with balls of very big diameter. The front and central bearings are single, the rear bearing being double. The use of ball bearings has necessitated a two-piece built-up crankshaft, the exact design of which is being kept secret. The use of ball bearings in both the 3-liter and the big Peugeot cars for the present season has been successful from every point of view. It is worth noting that Delage, the most serious rival of Peugeot in the 1913 races, also had motors with ball bearing crankshafts.

Lubrication is another feature which has been entirely changed from the previous season. Then it was a well-designed system of forced feed through a hollow crankshaft, one of the disadvantages of which was the difficulty of keeping lubricating oil out of the combustion chamber. On the new cars there is no oil whatever in the basechamber. On the front of the motor is a short cross-shaft driving a combined oil and air pump at one-third engine speed. The pump is of the piston type, fitted with a double piston ring. One of the difficulties in connection with this pump was that of lubrication when it was pumping air. If any oil collects in the basechamber it is drawn by the pump and delivered back to a big tank set within the frame under the driver's seat. When there is no oil in the basechamber, the pump aspires pure air, and through a pressure regulator maintains a determined pressure on the tank. By reason of this pressure, the oil is driven through a single feed pipe to a dashboard distributor having five glass sight feeds, four of which lead to the crankchamber, one to the overhead camshafts, and one to the pump and magneto shaft in front. It is not merely a drip but a powerful stream of oil which is sent through the sight feeds, for as this oil is not allowed to collect in the basechamber there is no possibility of an excess causing a smoky exhaust.

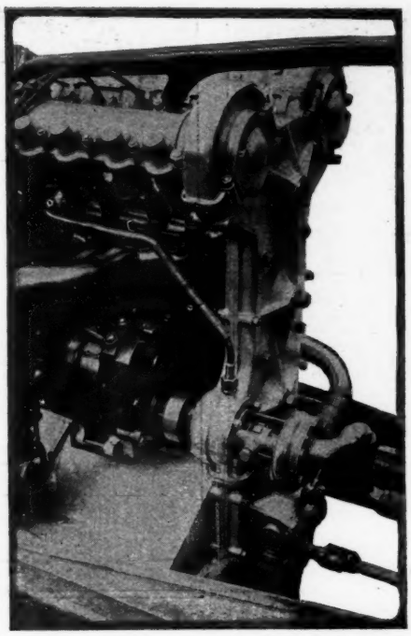
A constant level is maintained within the camshaft housings, and there is a return from these housings to the basechamber. Very big diameter breather pipes are bolted to the crankcase inspection covers on the exhaust side of the motor and brought up to a considerable height. All the oil pipes have special rubber connections to prevent breakage from vibration, and the lengths of rubber are bound in the center to prevent them bursting.

A Mea high-tension magneto has been used throughout the racing season. It is mounted on the right-hand side of the motor, on a platform cast with the cylinders, and is driven off the same shaft as the waterpump. The pump is to the front

of the timing gear housing, the magneto to the rear of it. The spark-plugs are mounted directly in the head of the combustion chamber. The Claudel carbureter has been used throughout the season's racing. It is connected up to the cylinders by a Y-shaped induction pipe, and on most occasions was devoid of any heating arrangement.

The cooling water is, as already indicated, kept in circulation by means of a centrifugal pump. The radiator is a cellular type, the system containing 3 gallons of water. According to the Peugeot engineers this motor develops 92 horsepower at 2,870 revolutions a minute, at which number of revolutions the piston speed is 48 feet 10 inches per second.

The previous year's three point suspension scheme has been developed so as to give greater relative movement between the power plant and the frame members. The motor and gearbox are mounted on an elongated U channel section subframe, with the open end of the U turned towards the rear. The basechamber and the box tend to stiffen this frame, forming a practically indeformable unit. Nevertheless, there is a universal joint between motor and gearset. At the front of the subframe there is a trunnion attachment to a double stout transverse frame member. Just above the rear of the gearbox there is a tubular cross member near the outer ends of which are carried, in bronze bushes, a couple of stout short arms. From the ends of these arms there is a ball and socket attachment to the ends of the subframe.



Front end of Peugeot 3-liter motor showing inclosed train of spur gear from crankshaft to camshaft

A cone clutch lined with a special fabric, is another feature adopted for the first time this year. The clutch is inverted, the female member being bolted to the rear face of the flywheel. Little change has been made in the design of the gearbox, which is of the four speed type with the shafts set in the horizontal plane. B.N.D. steel is used almost exclusively in this box, the primary and secondary shafts being hollow. The gate is inside the box, the horizontal rod to the end of which the change speed lever is mounted being carried within an aluminum tubular extension from the top of the gearbox casting and being quite independent of the frame members. The foot brake is this year internal expanding instead of external contracting, as a year ago.

Final drive is by propeller shaft, with all the effort taken through the broad semi-elliptic springs. The two universal joints on the shaft are mounted on ball bearings. The axle is built up of two taper tubes and a central vertically divided aluminum differential housing. The two tubes are machined out of the solid forging of B.N.D. steel and are marvelous examples of low weight and great strength. B.N.D, steel is used for the drive shafts, the driving pinion and the bevel wheel, and also for the differential pinions. The drive shafts are hollow.

The broad semi-elliptic springs, mounted directly under the frame members and under the axle housing, are supplemented by shock absorbers with the attachment stub welded to the frame member. The shock absorbers are thus entirely outside the frame members. Broad leather girths fastened to the rear cross frame member and passing around the axle housing help to eliminate violent rebound.

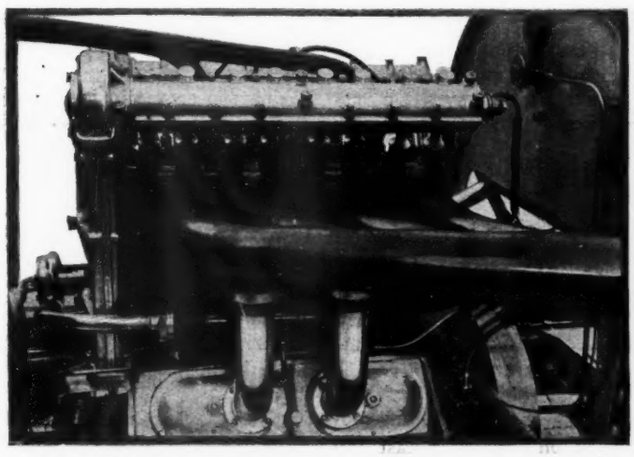
Provision is made for taking up wear on the rear brakes while the car is in motion.

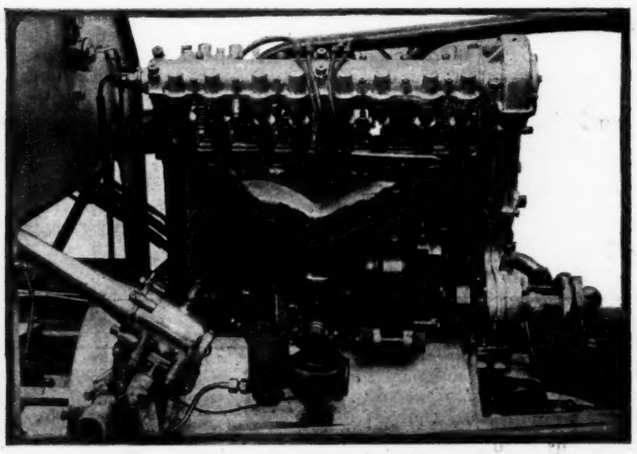
For its most important road races, such as the 3-liter event at Boulogne, where the roads are hilly, the Peugeot has run with a ratio of 3 to 1. Total weight of the car with oil and water, but without passengers and tools is 1,760 pounds. Rudge-Whitworth wire wheels with Pirelli tires have been used in all the races.

The success of the Peugeot cars has not been due entirely to the design of the cars themselves notwithstanding the great attention paid to details of design. Much of their success is traceable to an organization as perfect as the cars themselves and to a set of drivers that have developed with the cars.

To Make Storle Rotary Valve Motor

KEWAUNEE, WIS., Feb. 7.—The Storle Engine Co. of Kewaunee, Wis., organized last week with a capital stock of $50,000, will engage at once in the manufacture for the motor car trade of a rotary valve gasoline engine invented and designed by O. O. Storle, who established a factory in Kewaunee 2 years ago to develop his inventions. In addition, the concern will manufacture a two-cylinder poppet valve engine for farm use. The newly organized company takes over the factory of the Storle Valve Co., which is being remodeled to suit the purpose of building motors, and has purchased the Ziemer Foundry Co.'s plant at sheriff's sale. The casting shop will be overhauled and the company intends to make practically every part of its motors in its own shops. Officers have been elected as follows: President, O. O. Storle; vice-president, O. L. Pierpont; secretary and treasurer, H. O. Brandenburg.



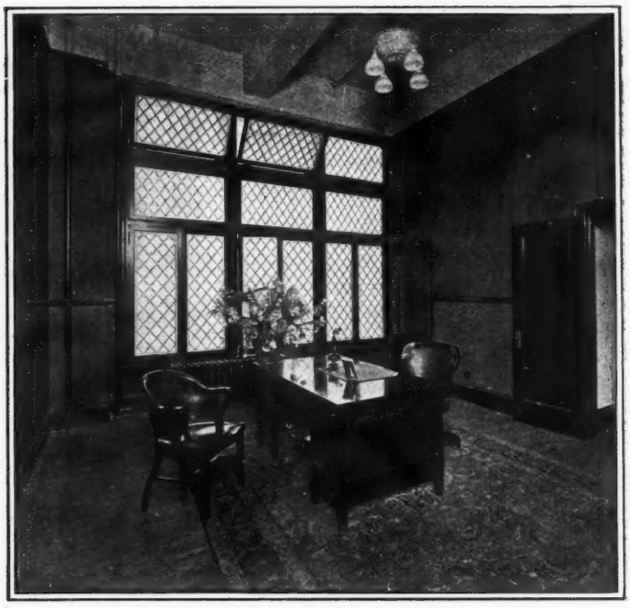


Exhaust side of 1913 Peugeot engine. Note large breathers. Right side of Peugeot engine showing carbureter, magneto and water pump

The top view shows the new building of the Frederick E. Murphy Automobile Co., Minneapolis, Minn., as it appeared when illuminated on the opening night. The illustration brings out especially well the admirable provisions for lighting the structure and also the balcony feature for displaying the cars.

In the middle illustration an excellent view is given showing the appearance of the Murphy garage building, the straight, almost severe, lines and good taste used in its construction being evident to the most superficial observer. The use of plate glass throughout the building renders it practically transparent and affords plenty of light and sunshine which, however, may be tempered when necessary by the use of shades.

At the bottom of the three illustrations is depicted the salesroom of the Murphy Automobile Co. Here the cars are placed on view amid surroundings which might tempt even the most wary investor into the reckless extravagance supposed to attend the purchase of an automobile. In this illustration an inside view is given of the balcony arrangement on which the cars are arranged for display purposes. The high ceiling permits of this feature. Note the hardwood floor with the single strip of matting running to the door. The palms placed here and there about the room serve to somewhat soften the otherwise cold severity of its appearance.



Ladies' Room at the Murphy garage building

A Salesroom-Garage De Luxe

Salesroom and General Offices on First Floor—Service Department and Stockroom on the Second

Third Story and Basement, Together with Remainder of First Floor, Are Used for Garage Purposes

AN unusually well-planned salesroom and garage has been completed for the Frederick E. Murphy Automobile Co., Minneapolis, Minn., its size and up-to-date appointments entitling it to rank with the very best buildings of this type in the country.

It is a three-story-and-basement structure, measuring 137 by 144 feet, with the salesroom and general offices on the first floor and service department, stock room and private offices on the second. The third story and basement as well as the remainder of the first floor are used for garage purposes.

Cream-White Brick in Terra Cotta Finish

The exterior presents a very striking appearance in its finish of cream-white brick in terra cotta, with story-high windows the full length of the two sides of the building facing the street. At night, the building is well set off by the electric lights that outline the roof and third-story windows.

The show room, which occupies the main corner of the building, measures 76 by 81 feet, and is two stories high. There is a hanging platform across the front of this room with ample space for the display of three cars, and at the rear there is a balcony which provides desk room for the sales force. The color scheme is good, the paneled walls and beamed ceiling being decorated in cream and buff, and the floor finished in blue and white tile.

The general offices are conveniently located to the right of the salesroom and run the full length of the building.

The space back of the sales room is used for a garage, with

the elevator located in the far corner, while on the show room side and next to the street is the superintendent's office with the oil room adjacent to it.

The superintendent's office has a glass front, making it easy to watch what is going on in the garage from the office. Another convenience is the lever at the side of the desk for operating the door at the garage entrance.

The oil room is adjacent to this office and is inclosed by a wire grating. Six Bowser pumps deliver the various grades of gasoline and oil from tanks which have a total capacity of 1,250 gallons.

Special Room for Oil Storage

A large part of the second floor is taken up by the upper part of the show room, the remainder being devoted to the shop, stock room and private offices.

The shop, measuring 54 by 144 feet, runs the full length of the right side of the building. It is well lighted and fully equipped with lathes, drill presses, emery wheels and a forge. Overhead hooks, to which chain pulleys can be attached, have been installed for the easy handling of heavy parts.

The stock room is conveniently located in the L formed by the shop and the passageway to the elevator, while to the left of the stock room and facing the street are two well-furnished private offices, one of which is illustrated.

The entire third floor and basement are available for storage purposes with a combined floor area of 40,000 square feet.

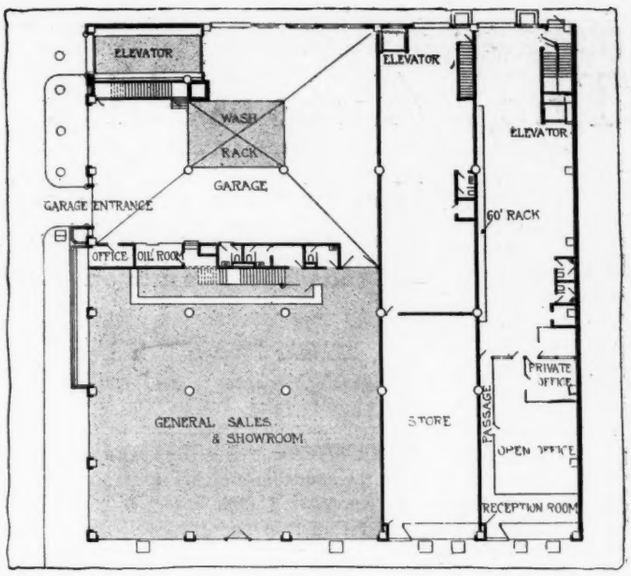
10,000-Pound Freight Elevator

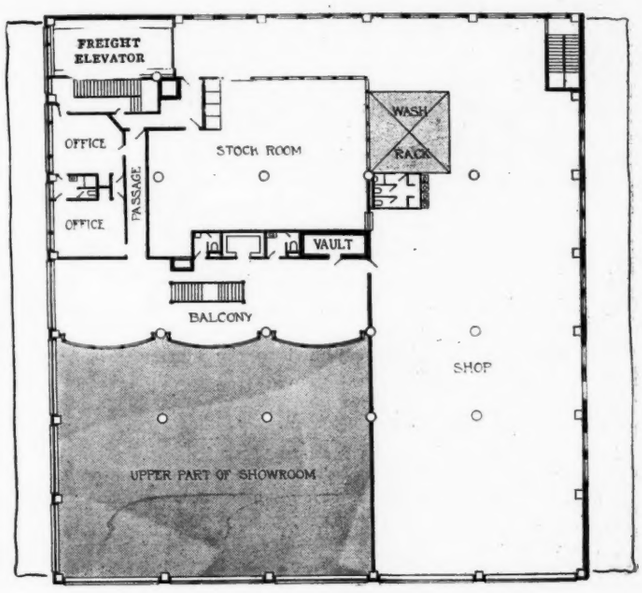
A 10,000-pound freight elevator that can handle its capacity load at 120 feet per minute connects all floors. It measures 11 by 30 feet, which is ample space for two touring cars, or the largest truck.

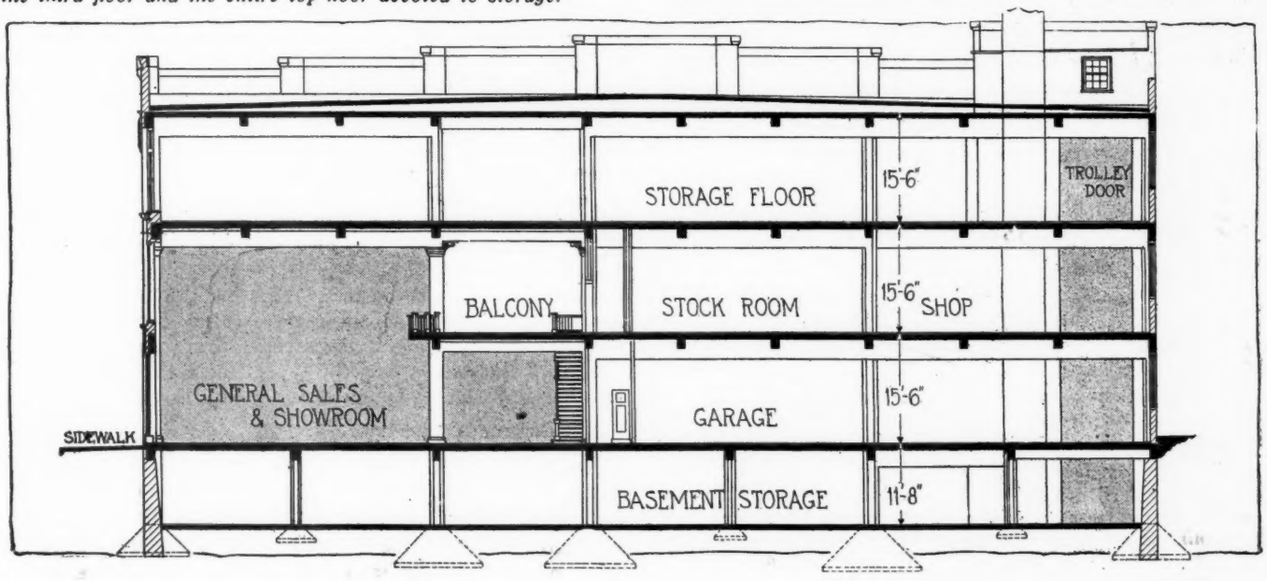
The three illustrations on this page show the floor plans of the three-story building recently opened by the Frederick E. Murphy Automobile Co. in Minneapolis, Minn. That at the top gives an idea of the layout of the first floor which contains the salesroom and general offices together with a part of the garage section, foreman's office and special room for the storage of oil.

The illustration at the right shows the second story of the building, including service department, stockroom and private offices. The upper part of the showroom occupies one corner, as indicated, while balcony overlooking the showroom may be reached by the flight of stairs indicated. The shop takes one entire side of the building on this floor.

At the bottom of the page is given a section through the building, showing the strong foundation for the iron-work, the basement for storage purposes, the balcony overlooking the salesroom on the first floor, arrangement of the garage space back of the salesroom on the ground floor, stockroom and shop on the third floor and the entire top floor devoted to storage.







The Automobile Engineers' Forum

User of Both Electric and Acetylene Lighting Systems Compares Their Efficiency, Economy and Appearance —Finds the Result in Favor of the Electric Apparatus

Thinks That If Self-Starter Is Demanded the Additional Weight Is Necessary and Lighting Equipment Weight Is Included

SWAMPSCOTT, MASS.—Editor THE AUTOMOBILE:—I have noted with interest the many arguments for and against electric lighting in comparison with gas. As a user of both kinds of lighting, I have had an opportunity to judge the merits of the two systems.

In the first place, Mr. Coombs seems to forget that he is comparing the cost of a full lighting and starting system with the cost of a lighting system alone. It is to be supposed that a starting and lighting system will cost more to run than a system, which in the majority of cases only operates two head lights occasionally. Let Mr. Coombs note, however, that a starting system may actually save gasoline by preventing the necessity of running the motor idle. To make the argument fair, the cost of operating an electric lighting alone should be compared with a similar cost for gas. When the starting element comes into the argument, there need be no argument. If we must have a self-starter, and the electric starter seems to be demanded, the added weight is necessary. The additional lighting equipment adds very little weight and expense, much less than a gas system with the same grade of starter.

The argument should be confined to the merits of the two lighting systems as such.

Safety to Be Considered

Let us consider safety. As far as sudden loss of light is concerned, there is little to choose between the two systems. Rubber hoses and copper pipes are just as likely to give way as wire cables are to break or short circuits to occur. But how about the fire risk?

As far as the appearance of the car goes, electricity again holds the upper hand.

As to quality: Electric lights are adjustable in focus so as to light the road near or far as may be desired. The light is steady, white and clean. Gas always flickers more or less, and accordingly is more tiring to drive or ride behind. It does not light the road as well, either near or far, as does electricity.

Convenience favors electricity in every case.

Both systems are reliable, I have found from experience;—although I have run out of gas a number of times on the road at night, and as yet have had no such experience with electricity.

Annual Cost of Electric System, $17

Cost seems to be the main issue, however. Cost due to weight of an electric system (lighting only) is not as much as usually stated. If the magneto and generator are one unit and the lighting battery replaces the ignition battery, the weight is about the same as the ordinary magneto, battery, and gas tank. The generator in a lighting system need only deliver about 6 amperes at a maximum. The figures obtained in the test of the Packard-Bijur system are unfairly quoted. They represent the absolute maximum gasoline consumption for the electrical equipment, several times what it would normally be under ordinary running conditions. A small generator for lighting system only would not consume over 3 per cent. of the engine's power.

Now assume a gasoline consumption of 2 1-2 gallons per day at 17 cents per gallon. Cost of lights per year is then about $4.66 in gasoline consumed. At 13 miles per gallon, the car has covered nearly 12,000 miles in the meantime. Add to the above amount $10 for battery maintenance and $2 for lamp bulbs, and we have a total yearly expense of less than $17.

Cost of gas for the same period will vary from $10 to $20 according to amount of night driving, leakage, and so forth.

Repairs on the electric and the gas systems will be about equal in cost.

Is not electric lighting superior to gas lighting? I have learned to believe that it is.—MALCOLM THOMSON.

Inherent Regulation of Lighting Current by the Lamps

WOODSFIELD, O.—Editor THE AUTOMOBILE:—I wish to compliment Mr. Newbold on his letter in THE AUTOMOBILE for January 15. Undoubtedly he knows what "juice" is. He puts up a good argument from a theory, but from results given in general practice there is often great divergence and one must always be prepared for results that are very different from what was originally expected.

Mr. Newbold has overlooked or else entirely ignored the main feature in my previous letter, and that is the inherent regulation of the tungsten lamps. He mentions conditions where it would be possible to obtain 35 per cent. increase e.m.f. or above normal. These abnormal conditions could be possible but if the average was no better than that an automobile lamp would not last a week and many of them would fall by the wayside within the first hour. Yet there are thousands of automobiles that have run 2 years and more that have had but one or two lamps renewed and it is nothing out of the ordinary to find cars that have run a year without a single replacement of any of the lamps while the bulbs of these lamps are still clear and not smoked up inside or do not show excessive strains. Consequently, the voltage regulation is better than 35 per cent. An overload or excessive voltage of 35 per cent. even for a moment, will leave a mark on a lamp that is not hard to find.

6-Volt Battery is Misnomer

There are several features I would like to mention from a practical standpoint. In the first place, the so-called 6-volt battery under normal working conditions could be called with greater propriety a 7-volt battery, at least its voltage under above conditions is nearer 7 volts than 6. Many of the manu-

facturers of lighting apparatus and also many of the automobile builders, recommend a 7-volt lamp for their cars, and the 7-volt lamp is becoming more popular as time goes on.

When a car is standing at the curb and the motor not running, with the light burning and using a 7-volt lamp, the lights are slightly below normal but it takes a trained eye to note it; at any rate there is an abundance of light and this feature is really an asset instead of a detriment. Where Mr. Newbold quotes from my previous letter that where the voltage of the dynamo exceeded the voltage of the battery it began charging and that if the lamps were burning at the same time and that any additional voltage above that would be absorbed by the battery, I did not intend that sentence to mean literally that the battery absorbed volts instead of amperes, but with increase of voltage the resistance in the lamps increases (here is where the inherent regulation of the lamps comes in), and electricity, like everything else in nature, takes the path of least resistance. Therefore, the current flows into the battery and this in turn has a tendency to lower the voltage output of the dynamo.

Sulphating Has No Terrors

However, I realize as Mr. Newbold points out that when the battery is fully charged and if then there are 10 or 12 amperes shot into the battery in excess of the current the lamps are consuming the voltage becomes abnormal. Such conditions as these are not tolerated with modern lighting equipments. With a storage battery that gets anything like decent treatment from a dynamo that has anything like regulation the sulphating proposition need not give any great worry until the battery gets old.

Referring to the tests mentioned in his letter I have tried every one of them and many others also. I would like to hear if Mr. Newbold ever tried taking an ammeter reading from a 6-volt tungsten lamp under an e.m.f. of exactly 6 volts and then increasing the e.m.f., say 35 per cent., then taking another reading to note if the current consumption has increased 35 per cent. He will find that it will not do this. If he repeats this experiment with a carbon lamp he will find that the current consumption has increased far in excess of 35 per cent. And while making these tests if he checks them up with a photometer probably he will have a nice surprise. The reason of this is very simple. Any metal filament lamp, and especially the tungsten, increases its resistance in proportion to its heat and this resistance chokes back the abnormal flow of current that would otherwise go through the lamp. With a carbon lamp on the other hand, the increase in heat of the filament reduces its resistance and thereby invites a still greater flow of current through it. This, in turn, further reduces its resistance and encourages still more current to go through it until it simply destroys itself.

It is this inherent regulation of the tungsten lamp that has made it possible for great cities to light their streets with hundreds of tungsten lamps connected in series, something that could never be successfully done with carbon lamps. As before stated, with the battery floated on the line under average conditions together with the self-regulation of the tungsten lamps and a dynamo that is within reasonable proportion to the battery capacity, the service is all that could be wished.

Dynamo Excess Unreasonable

Where Mr. Newbold states where the dynamo is capable of giving 10 or 12 amperes in excess of that the lamps are burning the voltage rises to 8 volts or 35 per cent. Now this is not to be tolerated with anything like good equipment. Furthermore, this is not floating the battery on the line at all, but, on the other hand, the lamps are almost entirely at the mercy of the dynamo for whatever current it has a notion to run into the lamps.

However, thanks to the improved regulation of some lighting outfits, if it were not for having light when the car is at the curb and the engine not running and for energy to crank the engine the battery would be superfluous as the lamps could be burned direct from the dynamo terminals with as good average regulation as in city lighting. In fact, I have seen this done where the battery had a jar broken or other trouble and the light burned direct from the dynamo for weeks at a time or until the battery was put back in the car.

Slight Surplus of Power Sufficient

A dynamo that is capable of delivering from 1 to 2 amperes above what it takes to burn the lamps is quite sufficient for all practical purposes. Therefore, your regulation is fine indeed as, under such circumstances, you have a mere fraction of a volt variation except when the storage battery is cranking the engine.

As an illustration, say it takes 200 amperes for 2 seconds to start the engine then if the surplus of energy delivered by the dynamo is 2 amperes above what the lights are consuming it restores to the battery the amount used in cranking the engine in 3 1-3 minutes. This will allow you to stop your car and crank the engine again every mile, traveling at 18 miles per hour. These figures do not take into consideration the loss in the battery but will give an excellent average as often it requires much less than 200 amperes to crank the engine. Then, besides this, even if you do run behind in your night running you have the day running without using the lights to restore the battery to maximum.—J. K. Mercer, electrical engineer.

Would Like to See Gas Consumption Figures for Lamps of Various Sizes

Cleveland, O.—Editor The Automobile:—I have been very much interested in R. H. Coombs' criticism of the electrical systems of automobile lighting together with the clean and frank answers he has received. Now that we have so much electrical data I would very much like to see in like form data as to the actual gas consumption to equal the light produced by 6, 21, and 24 candlepower, electric head lamps, 4 and 6 candlepower side lamps, 2 candlepower rear lamps, and his suggested substitution of the very essential dash lamp and trouble lamp. I would also like to see the data on the actual cost per cubic foot to the user of this gas as supplied in tanks. It appears to me that this discussion has done more toward the development of general interest in automobile lighting than anything that has previously come up.—J. E. White.

Thinks Acetylene, Carefully Handled, Stands for Economical Lighting

New York City—Editor The Automobile:—For years I have used acetylene for lighting my cars, the first car I owned, a 1907, model, having the well-known generator mounted on the running board and the second, a 1909 product, having the same apparatus mounted at the left side of the frame. Later, I added a Prest-O-Lite tank to this car and the car which I am running at present, a 1913 affair, uses only the tank.

Though I do a great deal of running in the evening, I find the acetylene tank system of lighting exceedingly economical, the total yearly cost generally running from $3 to $4.50 as it is practically never necessary to replace more than two or three tanks in a season. Of course, I never use the headlights in the city and whenever I come to a well-lighted road running into the city I stop and turn off the lights at once as I would have to do this anyway in a short time and would have used up a great deal of gas in the meantime if I had not turned it off.

Some rather indolent or impatient motorists will say: "That sounds like ancient history! Imagine stopping the car every time you wanted to turn out the lights!" Perhaps, I should have arranged my tank so that I could turn off the gas from the seat, but the fact remains that motorists like that do not belong to the economical class and yet they are probably among the first to bewail the high cost of living.—Henry F. Beswick.

The Engineering Digest

Latest Development in the Schoop Method for Spraying Fixed or Removable Metal Coatings on Any Surface

PLANT SIMILAR TO THAT USED FOR FLAME-WELDING

THOUGH the Schoop method has been on the industrial tapis for several years and has received the benefit of much publicity through the inventor's recognized position among electro-metallurgical scientists, it is still in the making, being every now and then improved or simplified by its author. Its claims to attention in the automobile industry rest perhaps mainly on the promise it holds out for a convenient process in converting frail patterns into metallic and unchangeable ones, which would mean both a saving and a guarantee in pattern shop work and all that depends thereon, but it is not excluded that it may be of importance also for the finishing of vehicle bodies and of accessories, and the fact that the plant by which it may be put in operation apparently may be shared with that required for autogenous welding to a considerable extent lends more actuality to the prospects than can usually be associated with inventive industrial enterprises not yet fully established. In this respect it is also of interest that the companies which have been formed in Europe to exploit the process are licensed on a royalty plan by which the inventor's fee is graded according to the size of the installation and the fostering of monopolies within any given territory is avoided.

Victor Bernard refers briefly in *Revue de Métallurgie* for December to the stages through which the invention has passed. At first the metal was melted in a special vessel, was taken under pressure through a conduit to a nozzle and was here caught in a violent current of compressed and heated gas which produced the spray. The apparatus was stationary and only metals of a low fusion point could be used. Later, to make the plant portable, the metal was prepared in powder form and this powder was melted and pulverized by means of a special type of burner. Among other faults attaching to this method that of high cost proved prohibitive. This shortcoming is remedied in the apparatus now in use by having the metal in the form of a wire, and, but for the attachment by three rubber tubes to tanks containing oxygen, hydrogen and compressed air, the apparatus is strictly portable, weighing only about 1 kilogram, and is easy to operate.

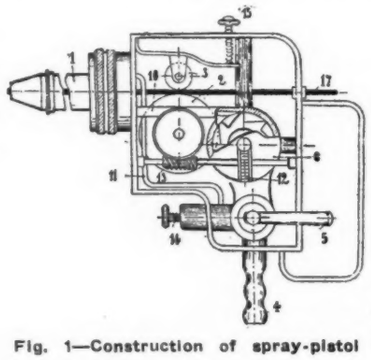


Fig. 1—Construction of spray-pistol

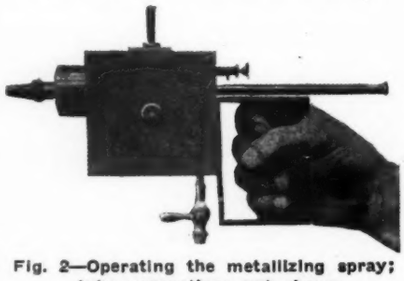


Fig. 2—Operating the metallizing spray; tube connections not shown

Hydrogen or illuminating gas under pressure combining with oxygen furnishes the flame to melt the wire, the pulverization is produced by an air current and the same air current drives a little turbine wheel by whose rotation the wire is fed to the flame at the proper speed. The construction and the appearance of the apparatus are shown in Figs. 1 and 2, representing two models differing only in the arrangement of details.

The compressed air enters the turbine 6 by way of tube 4 and petcock 5, drives the turbine at up to 30,000 revolutions per minute and, passing by tube 10, reaches a chamber back of the nozzle where it is regulated by passing through a series of circumferential holes leading to the interior channel of the nozzle. Tube 11, which also enters the nozzle, is the channel for one of the fuel gases, the flow of which is regulated by the needle valve 14. The other gas is similarly taken to the nozzle through another tube not shown in the drawing. The wire 17 is fed into the nozzle by the two rollers 2 and 3, and the pressure of the latter upon the wire is regulated by the screw 15, while roller 2 is actuated from the turbine shaft by means of the worm gear 12 and 13. It is readily understood that in the measure as the wire is melted in the oxy-hydric flame at the end of the nozzle it is pulverized by the air current and is projected with much force against the object to be coated with the metal of the wire, and this air current in conjunction with the short stretch of atmosphere through which the spray passes before it is received upon the object cools the spray so efficiently that it does not injure even an easily combustible fabric. On the other hand, a frail object must be backed so as to resist the violence of the current, mechanically.

The speed at which the wire can be fed, with a given air pressure and a certain turbine speed, depends mainly upon the fusion point of the metal. In the case of a zinc wire .8 millimeter in diameter and an oxy-hydric flame a speed of 7.5 meters can be attained. Lead can be sprayed still more rapidly, but a brass wire of the same dimensions not faster than 5.6 meters per minute. The wire must be arranged to unroll freely from a reel attached either to the operator or a neighboring object, according to the circumstances.

Lead, tin, zinc, aluminum, copper, brass, etc., are among the metals which can be sprayed and the inventor looks forward to similar action with glass and enamels.

According to the time of exposure the coatings obtained vary from very thin, merely decorative, films and others thick enough to be polished by ordinary means to detachable plates, several millimeters thick. The latter are especially suitable for reproductions of medals and engravings, taking the place of electrotypes to which they are superior in depth and accuracy by reason of the force with which the metal is projected against the original.

If an adherent surface is wanted for a metallic object it is advisable to clean the object and to roughen it slightly by means of a sandblast. If roughening is undesirable, heating of the object can take its place, as such preliminary heating also increases the adhesion of the coating. Non-metallic materials need only be cleaned by means of an air current, as a rule. If a detachable coating is desired, grease, powdered graphite, a film of oxidation or sulfuration usually suffices to secure this result.

Fig. 3 shows the whole equipment needed for the process, the picture representing the aluminizing of a sheet iron vat. It comprises an air compressor—including motor, compressor, tank,

tubing and oil-separator—steel bottles with pressure-regulating faucets for oxygen and hydrogen, the spray-pistol, so-called, and possibly a sandblast apparatus.

The cost of depositing 1 kilogram of copper or brass is given as about $1.55, distributed on the following items: Hydrogen 32 cents, oxygen 40 cents, time 30 cents, air 8 cents and metal 45 cents. This brings the cost per square meter to from 55 cents to $2.40, according to the thickness of the coating. The time used for a kilogram of these metals is about 30 minutes. With zinc the cost drops to 76 cents per kilogram, with lead to 28 cents, while with aluminum the cost of the metal brings the expense to nearly $2.

By a still later improvement or variation, which is not yet in the industrial stage, a considerable reduction of the equipment is effected by substituting an electric arc for the oxy-hydric flame for the melting of the metal. Two spray-pistols are placed at right angles to each other and carry each a metal wire, and the wires act as conductors for electric current. At the ends of the two nozzles the wires come close together, and an arc is produced between them which melts the metal of which they are composed. The air current is discharged at the same spot and projects the molten metal as before. This electric method, it is said, offers advantages in the case of refractory metals and when it is important to avoid all oxidation, which may occur by the oxy-hydric flame method if the adjustment of the gases is faulty.

A Conservative Cone Clutch Construction Noted for Accessibility

A DESCRIPTION with illustrations of the clutch construction used in Delahaye cars and trucks affords a convenient basis for considering or reconsidering the factors involved in clutch design. Fig. 4 presents most of the details. The leather facing of the male cone is underlaid with springs to assure the progressivity of engagement. The cone is connected with the primary gear shaft by a double articulation which is entirely protected against dust, automatically lubricated and easily taken apart to admit of the removal of the cone. This double articulation comprises a shaft *e* with a hexagon head at its front end and a hexagon cup at its rear end, into which enters a head secured upon the end of the primary shaft, with a space allowance for longitudinal sliding. Shaft *e* is formed with splines upon which cup *f* can slide, but normally the cup is maintained fixedly by means of a screw in the end of the shaft and the steel ring *d*. The front end of the articulation is closed by construction, the hexagon cup *k* being bolted to the hub of the cone, and the rear portion is inclosed in a prolongation *b* of the gear-box casing, and the prolongation is closed by the cover *a*, these elements constituting an oil-tight boxing into which lubricant may be poured at *x*. The washer *s* takes the end-thrust at unclutching and the fiber washer *t* serves as a gear-shaft brake. The front end of the construction is lubricated from a bore in the crankshaft, and there is noticed a gutter formed upon the flywheel web which obviates splashing of oil to the female cone surface.

In the dismounting of the joints and the cone, the tension of the clutchspring creates no difficulty. The manner of proceeding is as follows: The cover *a* is removed from casing *b* by loosening the securing-bolts, and the operating-fork *c* can then be withdrawn. The steel ring *d* is removed by means of a screwdriver, and then the cup *f* can be drawn forward upon shaft *e*, together with cover *a*, bringing ring *d* up against the rubber ring *g*. The cap *h* is unscrewed after the steel ring which binds it in its place has first been released. Shaft *e* can now be raised and withdrawn, entirely separating the clutch from the gearbox, and the bolts *j* can be removed. The driving-cup *k* can then be pulled out together with its shaft. A special device, similar to those used for withdrawing a wire wheel from its hub and not shown in the illustration, can now be attached by means of bolts *j* and can be adjusted until a yoke upon it abuts against the end-thrust bearing member *o*. By continuing to turn the vise-like auxiliary device, the clutchspring is compressed a few millimeters and the member *o* is withdrawn from grooves in bushing *p*. This done, the cone is turned by hand until the notches on *o* come in line with the grooves in *p*, and the cone can then be pulled out. If desired, the clutchspring can first be released by turning the withdrawing-device backward, thereby allowing the spring to extend gradually.

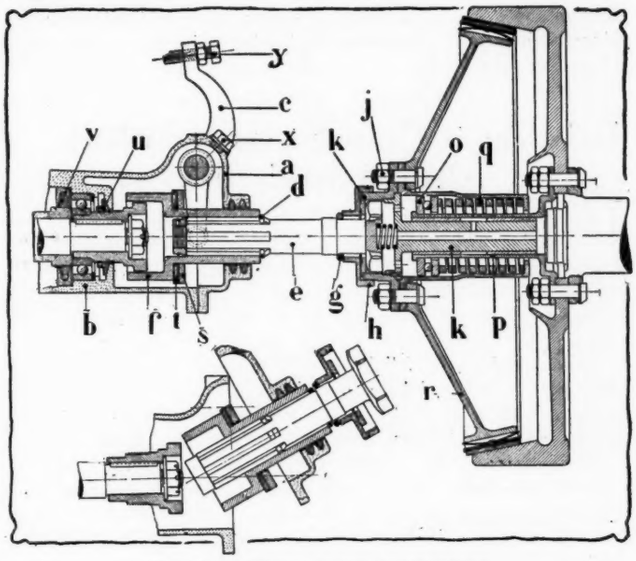


Fig. 4—Delahaye clutch construction

The screw *y* admits of adjustment of the clutch pedal to allow for wear or compression of the leather facing.—From *La Vie Automobile*, December 27.

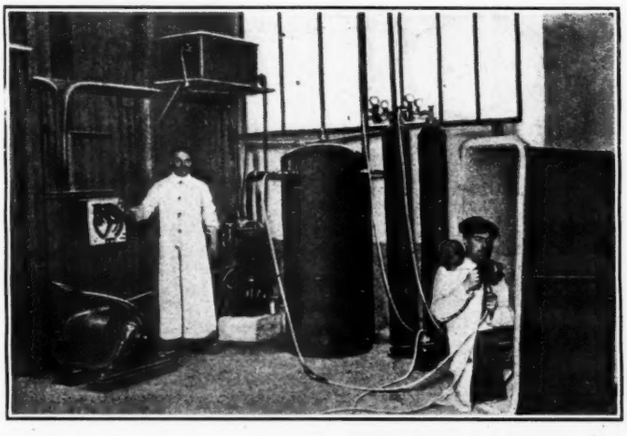


Fig. 3—Equipment for metallizing, partly applicable to autogenous welding also

Built-Up Steel Wheel with Tube Spokes Welded in Place

BY the combination of press work—first in the making of the rim and the hub ring and afterwards in the assembling—with the use of seamless drawn tubing and autogenous welding a British concern expects to place an inexpensive all-steel wheel in the market whose appearance, strength and accuracy should leave nothing to be desired. From the description given in *The Autocar* of January 10 the manner of mounting the wheel upon the real hub is left in doubt, however. The rest is simplicity itself, as shown in Fig. 5. The hub ring has staggered holes into which the flattened spoke ends fit. A corresponding number of holes are pressed into the rim, so as to form hollow

lugs on the inside of it. These lugs fit in the outer tube ends. In assembling, the spokes are first inserted in the hub ring holes, projecting somewhat into this ring. The outer spoke ends are then placed opposite to the lugs on the rim, the operation being directed and trued in a jig, and a tapered plug is driven into the hub ring, forcing the spokes outward to a firm seating over the hollow lugs. Finally, the inner and outer spoke joints are autogenously welded. This construction is evidently intended to be fortified by having the inner spoke ends abut against the hub mechanism.

By another method, indicated in another portion of Fig. 5, shouldered lugs are formed upon the hub ring, and the spokes are placed upon these lugs with the outer spoke ends contacting with the rim and opposite to small holes or slits in the latter. The metal adjacent to the small holes is then swaged into the outer spoke ends, forming lugs as before, and the welding again finishes the work. The holes in the rim are in both constructions plugged, it is said, to prevent the beads of the tires from "being blown into the spokes."

Relations of Cross Springs to Weight of Axles and Steady Steering

IN a review of the development of British and American cyclecars and small cars appearing in *Engineering* of December 5, the reviewer comments, among many other things, upon the means available for reducing the weight of small vehicles. Some of his remarks are quoted in substance in the following.

"The introduction of light American cars," he says, "will force the question of weight upon the attention of the European makers, and it is therefore interesting to see what are the special methods of construction adopted when a weight limit is introduced, as in the case of the cyclecar."

"It is noticeable that several firms abandon the conventional half-elliptic front springs of the ordinary car and use a single cross front spring. This plan appears to have many advantages, as it shifts the heavy center part of the springs from the axle to the frame and therefore reduces the unsprung weight, while it also very much reduces the bending moment on the front axle." [This is illustrated by a diagram showing how much nearer to the ends of the axle the load of the vehicle is supported when cross springs shackled to the steering knuckles are used than when half-elliptic springs are secured under the frame; the showing would be less decisive with the usual mounting of the springs at the sides of the frame, which, however, may be considered too expensive for the cyclecars under consideration.]

"It is not at all clear why the cross spring is not more used in the larger cars. Several makers use cantilever or costermonger back springs, and there is no reason why these should not be splayed out so as to bring the weight close to the wheel track."

[The advantage of the front cross spring, that it can be more flexible than ordinary springs—extending fore-and-aft and pivoted at their front ends—without interfering with a steady course of the front wheels on rough ground, is not mentioned. Yet, it is noticed that some manufacturers—Chenard-Walcker in France, for example—have gone back to shackling the front springs in front and pivoting them at the rear in order to avoid the interference which the position of the steering-arm which otherwise takes place, unless indeed either the semi-elliptic springs are made stiffer than is really desirable from other points of view or the front cross spring is adopted.]

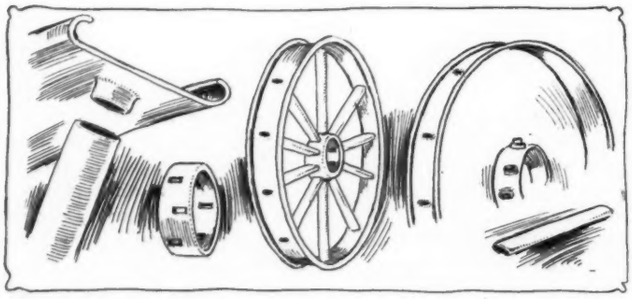


Fig. 5—Construction of Gavin-Armour all-steel wheel. Left: Method No. 1. Middle: Completed wheel. Right: Method No. 2.

Competition for Demountables by Improvement of Old Tire Type

JOSEPH STUNGO'S "rimless" tire construction, originated and tried in England, interests Germany by reason of its relatively low first cost and the avoidance of rim-cutting which its design seems to imply. It calls to mind some very early types of automobile tires by the large amount of rubber-compound in the retaining-flanges and the dependence upon metal rings imbedded in them for rendering continuous an otherwise non-continuous fastening of the tire upon the wheel. Fig. 6 is reproduced from the German illustration. The steel rings *c* cast into the retaining-flanges *b*, which meet squarely in the middle plane of the wheel, are of U-section and perforated to admit the passage of the bolts *d*. The compression of the tire flanges by the bolts is emphasized by conical bolt heads *e* and conical nuts *f* and the bolts project beyond both the head and the nut to form the studs *h*. The wheel is built with a simple and thin iron rim around the felly *i* and to the latter there are secured at intervals the angle irons *l* and the plates *m* by means of bolts *g*. Holes in *l* and *m* fit over the studs *h*.

The cost of this tire equipment, delivered in Germany, is about 40 per cent. lower than that of standard tires on demountable rims, for the same dimensions, and the work involved in mounting or dismounting it is of the simplest character. British tests during the past year are said to have been favorable.

The construction can of course be adapted to wire wheels and cast-steel wheels without special difficulty.—From *Automobil-Rundschau*, January 15.

THE Prince Henry formula for figuring the horsepower of cars, which was applied in the rating of the cars participating in the Prince Henry tour of 1910 and gives approximately the same results as the formula affording the basis for taxation of cars in Germany, is given by *Allgemeine Automobil-Zeitung* as follows:

$$HP = 0.007 \cdot i \cdot d^2 \cdot \sqrt[3]{s^2},$$

in which i is the number of cylinders, d the bore and s the stroke, both in centimeters.

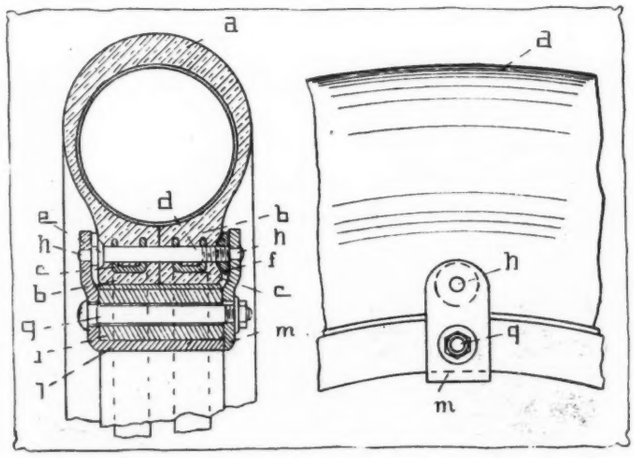


Fig. 6—New tire construction. Main feature: Steel rings of U-section imbedded in rubber flanges and pierced by bolts

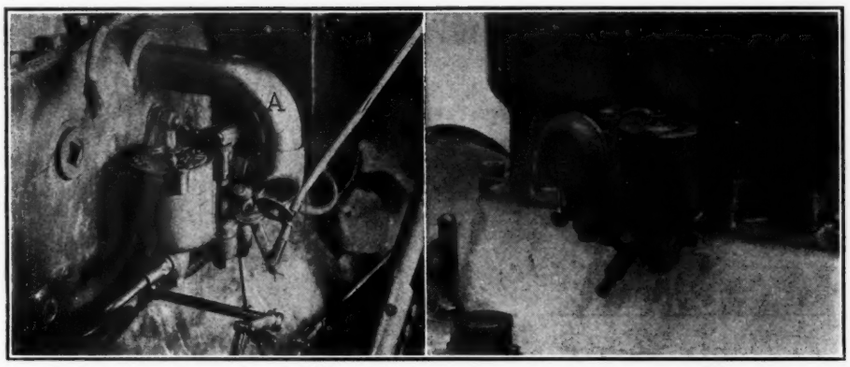


Fig. 1—Application of new Zenith carbureter to block-cast motor. Pipe A conveys hot air to intake. Fig. 2—Installation of horizontal type Zenith on four-cylinder Gregoire. Note bell-shaped air scoop

New Zenith Has Horizontal Flow

Carbureter Designed Specially for Use on Block-Cast Motors

DUE to the great number of block cast motors now being made both in four- and six-cylinder types, together with the increasing use of either pressure fuel feed from a tank at the rear or positive gravity feed from a cowl tank, the Zenith Carbureter Co., Detroit, has designed a horizontal form of its carbureter which takes advantage of these features of automobile construction.

The new Zenith is intended to be fastened directly to the block casting without the use of an intervening manifold, thus doing away with manifold bends.

Has Horizontal Mixing Chamber

The instrument differs from other Zeniths principally in the use of a horizontal mixing chamber instead of the vertical type, and in that the slow speed arrangement is altered slightly from the one previously used. Referring to Fig. 3, it will be noticed that the Zenith principle of compounding an ordinary nozzle with one having a flow independent of the suction of the engine is retained. The ordinary nozzle, or main jet, G gets its fuel from the float chamber through the channel E. It is surrounded by the cap jet H which receives gasoline through K from the well Q which is open to the atmosphere. Well Q is provided with a measured flow of gasoline through the compensator L which is not subjected to the suction of the motor and therefore has a constant flow.

Instead of the jet H running vertically and concentrically upward in the modified venturi mixing chamber as in the other Zeniths, it enters the venturi at right angles to the latter. Thus the gases pass horizontally direct into the cylinder block without turn. With the tube vertical, at least one bend is obviously necessary.

The new slow speed arrangement is really a miniature carbureter, being made up of the idling tube J, terminating in a cone up into which the idling tube P can be screwed more or less by means of the knurled adjusting tube O. The tube Z connects J with an opening drilled in the carbureter body near the throttle. Acting in the same way as with the other models, when the throttle is only slightly opened as at starting, the suction at this opening is very powerful, drawing fuel up from the well Q through the nozzle of P and tube J, at the top of which it mixes with air entering through the holes in the upper part of O. The mixture thus made is further atomized and sprays into the carbureter proper just back of the connection to the cylinders. This gives a good mixture for starting, and of course, as the throttle is opened wider, the compound nozzle comes into play and the miniature carbureter no longer has any effect. It does not interfere with the action of the carbureter proper throughout the range of speeds from medium to high.

This compounding of two nozzles of opposite qualities is the main feature of the Zenith principle and appears in the same general form in the newest models as in the vertical types of the same make.

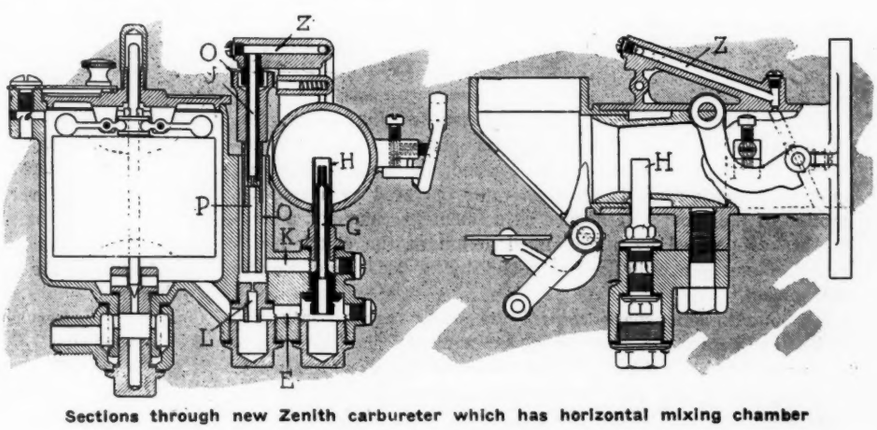
Regular Features Retained

This new Zenith retains all other features of design which are characteristic of its older brothers, having the metallic float with overhead float action, removable venturi tube, interchangeable nozzles of different sizes, and so on. The horizontal type is best adapted to block castings where the intake passage is cored in and passes through the center of the block to the valve side.

Other advantages that can be claimed for this model are that it occupies a position otherwise unoccupied, and being higher than usual interferes less with the other accessories. In addition there is the elimination of bends in the manifold, an important consideration when it is taken into account the great resistance to the flow of the gases that bends offer in comparison with the same length of straight path.

Fig. 1 shows the application of the new Zenith to a well-known car. In this installation, hot air, taken also through a cored passage in the top of the cylinder casting, is conveyed to the air intake of the carbureter through the pipe A. A small flap actuated from the dash, and shown in full open position, may be used to control the hot air. When partially closed, all the air entering the carbureter is preheated, and when fully closed, the carbureter is choked, causing the formation of an excessively rich mixture for use in starting a very cold motor.

Fig. 2 is an installation of the horizontal carbureter on a four-cylinder Gregoire engine of the block type. In this case, an air scoop similar to a bell takes the place of an air tube to the cylinder head.



Sections through new Zenith carbureter which has horizontal mixing chamber

The Rostrum

Believes Ford Profits Should Go for Completer Equipment

EDITOR THE AUTOMOBILE:—In all the discussion of the Ford profit-sharing plan that has appeared in the public prints since Henry Ford astonished the world by his fruit-cutting pronunciamento there is one feature that appears to have escaped the attention of the numerous critics that, in the opinion of the writer, merits consideration.

In the cutting of the big Ford melon only one class of people is given consideration in its distribution—the employees of the Ford factory, those who, Mr. Ford claims, have been instrumental in making the Ford car the commercial success that it is.

The genius of Henry Ford in the conception of an automobile that could be built and sold several hundred dollars less than other automobiles of equal carrying capacity and serviceability is regarded as the first factor in Ford success. The construction of this car by artisans to meet these commercial requirements stands as factor number two and apparently a complete whole in the opinion of Mr. Ford, who is quoted as saying that in the distribution of an accumulated surplus of ten millions of dollars beyond the desires of wealth on the part of the Ford Motor Company it should be given to his employees, who have by their labor made possible the accumulation of this great fund.

It is admitted that without the genius of Mr. Ford and the help of his artisans there would have been no Ford automobile, and consequently no ten-million-dollar melon to cut. Neither would there have been anything of the kind had there not been several hundred thousand good fellow compatriots scattered all over the world who cut their little "melons" and shared with Henry Ford, often generously giving him the biggest half in exchange for his cars.

As a humble motorist who has owned and driven cars of various makes—including a Ford—and who has been more or less observant of car construction, refinement and reliability, the writer often has wondered why, in building a car possessing so many admirable qualities, Henry Ford has not taken into consideration more the interests of that great indispensable factor to his success—buyers of Ford cars. That the Ford car as marketed is regarded to be short of essentials and refinements is shown in the almost limitless parts and accessories made in all sections of the United States and exploited as indispensable to the convenience and comfort of Ford car owners, and that they are so regarded by the possessors of Ford cars is proven by the sale of these "accessories." from sight oil glass to electric starter. In his astounding success in accumulating wealth as a car builder, and incidentally a "melon" carver, Mr. Ford would strike a happy medium in his profit-sharing philanthropy by giving recognition to buyers as well as builders of his cars. Let the workingman have his in cash; the car buyer his share in the form of a car possessing more and better equipment and greater refinement—with no increase in cost to him.

New London, Ohio. G. W. R.

Reader Gives Opinions on Motor Car Control

Editor THE AUTOMOBILE:—In your issue of January 29, Mr. H. L. Collins invites a discussion of his opinion on the best method of motor car control which method, he states, embraces: automatic spark control; an accelerator operated by a sidewise motion of the foot; a dashboard adjustment for starting; a service brake operated by a prolonged action of the clutch pedal, and the emergency brake controlled by a pedal and ratchet mechanism.

As to automatic spark control the writer agrees with Mr. Collins. There is no good argument against it and it relieves the operator of considerable care and more or less guess-work, in manipulating the spark lever. The foot-throttle I do not advocate because controlling the gas lever is too delicate an operation to be performed by the foot for the best results. The throttle is perhaps the most sensitive part of a car and should therefore be governed by the most sensitive member of the body, the hand. However, the foot throttle is of use in resting the hand, as I have found when both hand and foot devices are fitted.

As to the dash adjustment I take it that Mr. Collins means adjustment of the carbureter from the seat. This is most desirable and is a part of the regular equipment of most cars. Operating the service brake by prolonged action of the clutch, I do not approve of because it is very often desirable to use both the retarding effect of motor, with closed throttle, and the service brake in descending sharp grades. This would obviously be impossible were the clutch and service brake inter-connected.

The foot operated emergency brake is not approved of because greater leverage can be obtained for this important device by using a long hand lever, also the ratchet mechanism can be more positively operated by the hand than by the toe.

Theoretically the best method of motor car control, in the writer's opinion, embodies the Entz electric transmission used on the Austrian Daimler and described in THE AUTOMOBILE for December 8, although I have never ridden in one of these cars and cannot say how it works out in practice.

East Canaan, Conn. D. C. CANFIELD.

A Motor-Driven Cotton Picker

Editor THE AUTOMOBILE:—So many applications have been found for the gasoline motor in the few years of its existence in practical form that a description of the cotton picker illustrated in Fig. 1 must be of interest.

It is almost human in its intelligence, has an enormous capacity for work and yet, has the finest discrimination in picking the ripe bolls and leaving behind the leaves, and imperfect or undeveloped ones. With fingers as sensitive as a blind man's it passes through the rows of cotton and gathers the crop with amazing swiftness, and deposits the lint in canvas bags attached to the machine.

It operates by means of a 30 horsepower gas engine, which supplies power for the picking mechanism and for propelling the truck on which it is mounted. At the expense of five or six dollars a day, including the pay of a driver and boy, gasoline, etc., this machine can harvest between 5,000 and 6,000 pounds of cotton in a 10-hour day.

The picking is done by needles which pass through the foliage, twigs, etc., without engaging them, but secure the woolly mass of the ripe bolls. Hundreds of these delicately adjusted needles are found in the cylinders of each machine. It does the work far more rapidly than any gang of darkies could handle it and not only does it cheaper but better and with less waste. It seems to me that it promises to take its place with the harvester and the sewing machine as one of the epoch-making labor saving devices.

Los Angeles, Cal. C. L. EDHOLM.

Battery Cells in Series-Multiple

Editor THE AUTOMOBILE:—We note that in discussing jump spark ignition systems on page 1196 of THE AUTOMOBILE for December 25, you advise the use of two batteries and a two-way switch in connection with the ordinary unit coil ignition

Fig. 2—E. M. F. touring car arranged for driving threshing machine

Fig. 1—A motor driven cotton picker that collects the bolls and deposits them in bags on each side of the machine

system, stating that the life of the batteries may be prolonged by operating them intermittently. It is true that if the car is used constantly this method of connection will effect a slight saving.

A simpler and more economical plan is to connect all the cells in series multiple, making one large battery instead of two smaller ones. This, in the first place, allows a single-throw switch to be used in place of the double-throw switch. In the second place the current drain, in other words, the current flowing when the circuit is closed, from each cell will be cut in half. Now, the useful life of a dry cell is determined by a number of factors, but the most important is the rate of discharge. The smaller this is within certain limits, the longer the proportionate service-life of the cell. For instance, suppose that with a given current consumption the service-life of a cell is 100 hours. If the consumption is halved, the life will be more than doubled and will be perhaps 225 hours.

The following figures, obtained by actual experiment, show the reduction in battery cost. The tests were made upon a four-cycle, four-cylinder automobile engine speeded at 20 miles per hour. The engine was equipped with a standard commercial vibrating coil adjusted to draw a moderate current. No. 6 Columbia dry cells were used, connected as described below. After the batteries were installed, they were required to run day and night without stopping until the engine began missing. In actual practice the mileage obtained would probably be increased considerably, because the cells would have a chance to rest and recuperate when the engine was not running.

Arrangement of Cells	Hours Service	Estimated Miles Service	Estimated Cost Per 100 Miles
1 set of 5 in series	25	500	$0.25
2 sets of 5 in series-multiple	70	1,400	.17
3 sets of 5 in series-multiple	120	2,400	.12
4 sets of 5 in series-multiple	200	4,000	.10

From the above table it is evident that the service obtained by connecting two sets of five cells in series-multiple instead of using two sets of five in series, alternately, is not twice the service, but almost three times the service. This is especially true if the cells are used for ignition or some other service which demands a fairly heavy drain.

Cleveland, O. NATIONAL CARBON CO.

The Application of Metal Disks to Wheels

Editor THE AUTOMOBILE:—In your number of the 29th, you answered an inquiry by Mr. D. C. Canfield regarding the application of metal disks to the ordinary wood wheel. I have had my raceabout equipped with heavy, sheet steel disks for about a year and find them on the whole very satisfactory. When first attached they were bolted on as you suggest but would not stay tight and would rattle. I found that a better method was to fasten them by means of short, heavy, round-headed screws, using

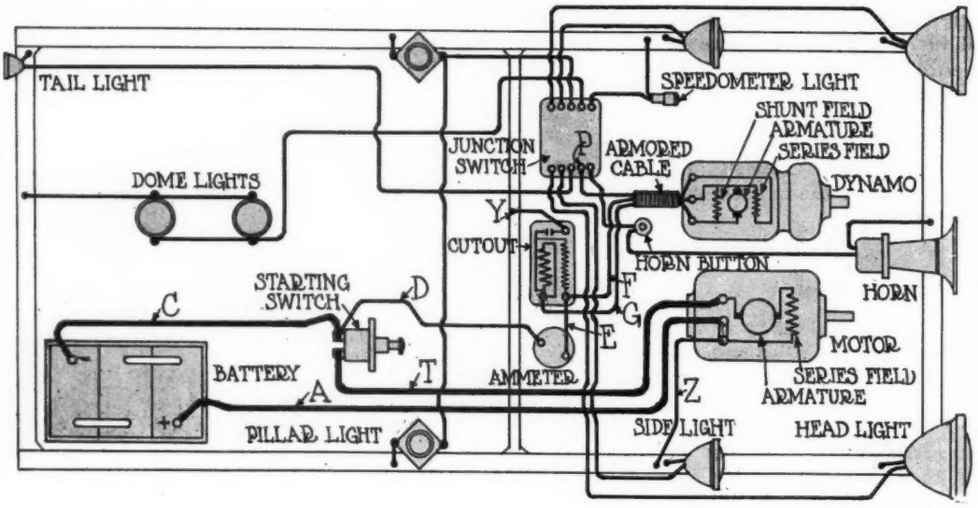


Fig. 3—Wiring diagram of Gray & Davis starting and lighting system as installed on the 1914 Overland. The system includes a complete set of lights and a horn. The heavy lines indicate the starting circuit. The lighting circuit is a single wire system, the lamps and horn being grounded on the frame, and so the current, after passing through the lamps, returns to the generator or to the battery through it. The wiring is so arranged that the generator will operate the lights even when the battery is removed from the car.

small washers. This method has proven entirely satisfactory.

The disks undoubtedly keep the wheels and also the car itself much cleaner, but in a high wind or on the track I find that they make steering more difficult. My advice would be to apply them to the rear wheels only as the front wheels do not get as dirty as the rear, thereby doing away with the objections to steering.

Columbus, O. EDMUND B. NEIL.

Uses Car for Driving Thresher

Editor THE AUTOMOBILE:—Some time ago I saw a jackshaft arranged for sawing wood; it then occurred to me that I could use a similar arrangement for driving a thresher. Fig. 2 shows my E. M. F. 30 driving a 27-inch machine. It occurred to me that it might interest some of your readers and be the means of helping some of them as it did me if you would publish this in the Rostrum.

Fair Haven, Pa. J. E. WALLACE.

Overland Starting and Lighting System

Editor THE AUTOMOBILE:—I would like you to publish a diagram and detailed description of the starting and lighting system used on the 1914 Overland.

In the description given by the Overland company I do not see, as per their diagram, the connection between the generator and the storage battery. Does the electric motor revolve after the engine starts?

Modoc, Ind. T. C. KÄBEL.

—1—The starting and lighting equipment used on this year's Overland is the Gray & Davis system, Fig 3, and comprises three principal units:

a—The generator which produces the current and delivers it to the lamps and storage battery.

b—The storage battery which accumulates the current thus generated and delivers it to the lighting system or the starting motor as occasion demands.

c—The starting motor which receives current from the storage battery and revolves the engine whenever it is to be set in motion.

Besides these three principal units the system includes the following auxiliary apparatus:

d—An automatic cut-out, whose function is to disconnect the generator from the storage battery when the engine is stopped or running below the speed at which the generator's voltage is high enough to charge the battery. The cut-out is located on the engine side of the dash.

e—The starting switch which is a pedal-button located in the floor board of the car convenient to the foot of the operator.

f—The ammeter whose purpose is to show whether the system is working properly or not. When the dynamo is running and sending current to the storage battery the ammeter hand will point to the right of zero or at "charge." When the lights are burning or the starter motor is running, this hand will point to the left of zero or at "discharge," thus indicating the rate at which current is going out of the storage battery.

The speed of the generator is controlled by an automatic clutch that is so designed that, no matter how fast the engine runs, the generator will not be driven faster than a certain predetermined speed which corresponds to that at which the engine runs when driving the car at 12 miles per hour on high gear, but, of course, if the engine drops below this speed the generator will also. This is done by means of a centrifugal governor which regulates the slippage of the clutch so that the generator can not be driven faster than the predetermined speed, the greater the speed of the engine the more the clutch slips.

The current load is automatically taken care of by a compound winding on the generator.

The starting motor is a series wound machine, that is, the entire armature current passes through the field. The motor is provided with an over-running clutch which allows it to drive the engine but automatically disengages when the engine starts so that the engine will not drive the motor. If such a device were not fitted the generator might be injured by the motor driving it at too high a speed.

As already explained, the function of the automatic cut-out is to disconnect the generator from the battery when the engine is stopped or turning so slowly that its voltage is below that of the battery. If this cut-out were not provided the storage battery would discharge back into the generator.

The cut-out consists of an electro-magnet with two windings. One is a shunt winding of many turns of fine wire and the other a series winding of a few turns of heavy wire, both windings being over a soft iron core. The shunt winding is permanently connected across the positive and negative terminals of the generator, so that when the generator comes up to charging speed, this winding energizes the magnet core and the magnet core attracts a steel arm that closes the circuit between the generator and the battery.

So long as the cut-out points are closed the current must pass through the series winding of the cut-out. This current adds its magnetizing influence to that of the shunt winding and holds the points together. The cut-out is designed so that it closes at a car-speed of 12 miles per hour and opens at 10.

If, now, the speed of the generator drops below charging speed, the current begins to flow through the cut-out series winding in the reverse direction. This weakens the pull and allows the points to fly apart, through the agency of a spring.

Now that a general idea of the different parts of the Gray and Davis system has been obtained, the path of the current in the different wires will be explained. The illustration shows this system with a very complete equipment. Besides the usual head,

side and tail lights, there are pillar lights, dome lights, a speedometer light and an electric horn connection. It will be noticed that the return circuits are through the frame with the exception of the connections between the storage battery and the starting motor.

First we will trace out the flow of current when the starting switch is closed, this circuit being shown by the heavy black lines. Current flows from the plus terminal of the storage battery out through wire A to the motor, where it passes through the series field and the armature and from thence, through the wire T to the starting switch and from there, through the wire C to the negative pole of the battery.

Below 9 or 10 miles an hour or when the motor is at rest the cut-out is open and therefore current for the lights must be furnished by the battery, and its path is as follows: It runs out through wire A to one terminal of the starting motor where it goes to the frame through the ground wire Z. From thence it runs to the lamps. From the lamps the current passes to the junction switch where all the lamp terminals are connected to the terminal P, and from here, the current flows through the series field of the generator and on out through wire F to a terminal on the cut-out, and from thence to the ammeter over the short wire E. From the ammeter it goes via wire D to a binding post on the starting switch, from which it connects with the other pole of the battery by wire C.

At or over 12 miles per hour the cut-out contact points are closed as previously described. Current is then supplied to the storage battery if it needs charging and also to any of the lamps that are in circuit.

If the battery needs recharging it is of course below the voltage of the generator and therefore current will flow to it until its voltage becomes equal to that of the generator when the flow will automatically stop because the electrical pressure at the two points is the same. The current passes from the positive terminal of the generator through wire G to the series coil of the cut-out and from thence through wire Y to the frame. It flows through the frame up through wire Z to one terminal on the motor and from thence through wire A to the plus pole of the battery. The return circuit is through wires C and D to the ammeter and from thence through wires E and F back to the generator.

The flow of current from the generator to the lamps is as follows: Through wire G and the series coil of the cut-out and wire Y to the frame. This part of the circuit is identical with that for charging the storage battery. Then the current goes through the frame and up through the ground wires to the lamps, from whence it passes to the terminals on the junction switch and on through wire P to the generator.

It will be noted that the generator and battery circuits to the lamps are independent so that should anything happen to the battery, the lights could be operated by the generator alone.

An Easily Made Soft Hammer

Editor THE AUTOMOBILE:—A soft-faced hammer often comes in handy around an automobile wherever heavy driving is to be done on metal that must not be marred or scratched.

Nearly every automobilist carries a hammer of some sort around and is therefore loath to believe that another hammer, even a soft-faced one, is a necessity. Wherever metal parts are to be protected he protects the driven piece with wood, leather, or other soft substance. There is nothing handier, however, than having a hammer that is itself soft and I have made various kinds for machine shop usage, some out of all-metal from pipe and pipe fittings and others similar to the one in Fig. 4.

To make this one, use an ordinary gas pipe that will easily slip over the head of the hammer and cut off a suitable length so that when finished and assembled the proportions will be about as indicated. Saw out any number of V's from the pipe so that when the teeth are bent inward a spring is formed that will snugly catch the head of the hammer.

After the V's are cut out of the pipe, slip the pipe over the head and arrange for pouring the lead or babbitt. The mould is easily made by submerging nearly the whole hammer in sand or by filling the space between the pipe and hammer head with putty. Part of the hammer head should be surrounded with the poured metal in order to insure a good close fit, but the fit must not be too close. It is well, before pouring, to wrap a single thickness of paper around the head, holding it in place with thread or string.

Lastly, bend in the teeth to produce the spring-locking effect and you have a nice serviceable hammer.

As soon as the face is worn it is a simple matter to repair it by melting out the soft metal, and remolding it.

New York City. W. F. S.

A Racy Coupé Body Design

Editor THE AUTOMOBILE:—Fig. 5 shows a sketch of a coupé which I think is superior in design to other types of present day inclosed cars. Its features are a low, streamline body with gasoline tank and tires carried at the rear. It has inclosed chain drive and wire wheels. The use of a tank in the rear together with the mounting of the tires behind it tends to give this body a very racy appearance. Other points worthy of note is the curved body top, the peculiar shaped window and door and the wide lattice panel extending around the body. These features, together with the sloping hood give the car a very low and rakish look.

Brunswick, Me. BRUCE PRICE POST.

Complains About Car Adjustment

Editor THE AUTOMOBILE:—There is one feature about the medium-priced and cheap cars about which I would like to complain. A great many of these cars are delivered without sufficient testing and, therefore, they are not adjusted as finely as they should be. How many of these cars will show the same speed and hill-climbing ability as the demonstrating cars owned by the agents? Very few; and for the reason that the car delivered to the owner has very little done to it after it leaves the assembly floor while the car the agent uses for demonstrating is tinkered and fussed with by his expert chauffeurs until carbureter and other delicate parts are working perfectly.

New York City. R. F. D.

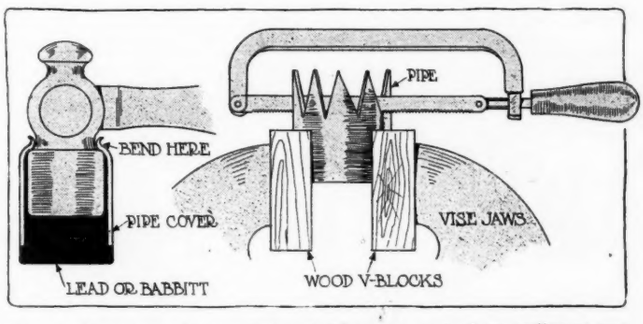


Fig. 4—How to make a soft-headed hammer out of an ordinary one

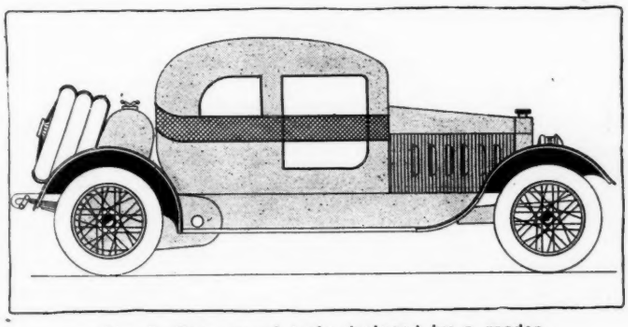


Fig. 5—Racy coupé body designed by a reader

Review of Shock Absorber Field for 1914

Several New Designs Have Been Brought Out—Spring Cushion Models Most Popular with Friction Types Second—A Variety of Principles Used in Others

A SURVEY of the shock absorber situation for 1914 shows that several new concerns have sprung up in the past year. Some new ideas have been evolved but on the whole very few changes have been made, just a slight improvement here and there being noted.

Of the twenty-seven principal manufacturers only twelve are making shock absorbers using the term in the stricter sense, the others making cushion or auxiliary springs of various types.

A classification of these shock absorbers according to their principles of operation indicates that there are three different types and some combinations of these. The compression of air or a spring, or the forcing of a liquid through an orifice are the three methods used in their operation.

Spring shock absorbers—and the majority of these are the cushion type—are greatly in the lead, with thirteen manufacturers making this type. Next on the list come friction shock absorbers, with a total of eight. One hydraulic and two pneumatic models are seen and the remaining four embody combinations of the three main principles, there being one each of the following types: hydraulic-pneumatic, spring-hydraulic, spring-pneumatic, and spring-hydraulic-pneumatic.

Seven new companies have entered the lists this year, the Herz with a shock absorber in which a semi-liquid composition is used, the Hoover company with a rebound check and Rex, Powers, Universal, Overman and Hassler with cushion springs. New models brought out by old concerns include a cushion spring by the Hartford and Sager companies. A new Velvet design has been produced especially for the Ford and in this connection six other concerns, the Mitchell, Ely, Halladay, Walker-Moore, K-W and Hassler companies are making cushioning devices for the Ford exclusively. The latter concern, however, is planning to bring out other models soon.

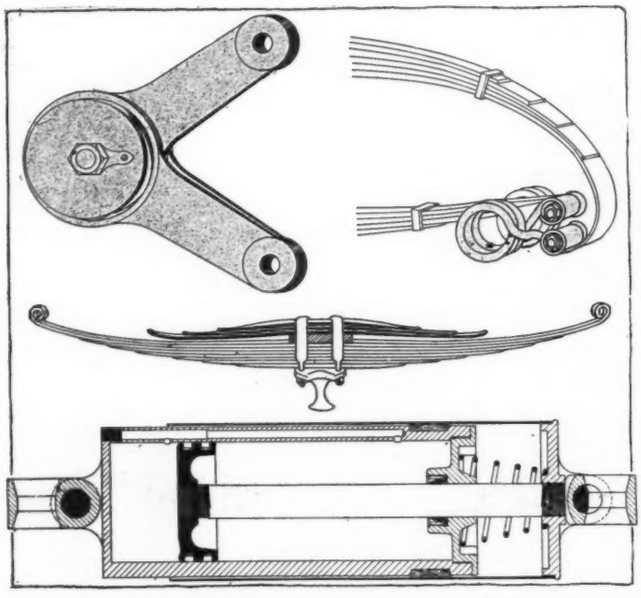


Fig. 1—Top, right—Acme torsion spring. Fig. 2—Top, left—Mondex friction type. Fig. 3—Middle—Ames shock absorber. Fig. 4—Bottom—Air shock absorber

Acme—Replaces Spring Shackle

No new features have been brought forth by the Acme Torsion Spring Co., Boston, Mass. The Acme shock absorber, Fig. 1, is a cushion type designed to replace the spring shackles and is equally adapted to front or rear. The Acme is made from round bar stock and comprises a triple coil on each side of the spring member, the ends of the coils being looped so that they will go over the spring bolts. The torsion spring principle, originated by the Acme company, is said to produce a very easy riding car, the sensitiveness of these springs absorbing all the small shocks that are ordinarily transmitted to the car body because the large car springs do not act quickly enough to take these small shocks up. Besides making the car easier riding, Acme torsion springs prolong the life of the car and increase the tire mileage, it is claimed. They are made for all types and sizes of cars including the Ford.

Air—Is of Pneumatic Variety

The Air shock absorber, Fig. 4, manufactured by the Kilgore Mfg. Co., Boston, Mass., has several small improvements this year. Small parts have been strengthened, the method of attachment has been improved and the adjusting mechanism has been simplified. As its name implies, this shock absorber is of the pneumatic type, a piston compressing air and forcing it through a series of small orifices. This construction offers a cushioning effect proportional to the speed of the axle movement, a quick movement resulting in the compression of the air to a very high pressure, while with a slow movement the air has time to escape through the orifices without the generation of much pressure. This shock absorber is double acting, compression of air occurring in either direction. The air that escapes through the small holes is by-passed to the other end of the cylinder. An adjusting valve is provided for controlling the spring movement. These shock absorbers are made in four diameters to suit cars of different sizes, the price varying accordingly from $75 to $120 per set of four.

Ames

The Ames shock absorber, Fig. 3, is simply an inverted three-leaf spring rigidly fastened to the main leaf spring, a carefully adjusted steel spacing block between these two members holding them the proper distance apart. This auxiliary spring is designed to take up the recoil. Instead of it reaching the body of the car the recoil travels back and forth between the two springs until its effort is wasted. Ames shock absorbers are easily installed by placing the spacing block and the inverted spring on the top of the main spring and bolting the whole together with a longer spring clip furnished with the shock absorber. The price per set is $45. They are made by Clarence J. Peacock & Co., New York City.

Mondex—Parallels Spring Action

In the new Mondex Shock Preventer, Fig. 2, made by the Aristos Co., New York City, rubber and air are the materials used to provide a resistance that will vary according to the spring movement. The shock preventer consists of a series of inclined planes of high carbon steel bearing against hard brass plates, the surfaces of the two being built on the wedge principle so that as the arms of the shock absorber come closer together these plates compress disks of rubber honeycombed with air chambers so that a pneumatic effect is obtained. The rubber and air cushion rapidly increases its resistance as it is compressed so that a heavy shock meets with much resistance and a light shock with little. The difference in force between the up and down motion of the car is taken care of by properly regulat-

ing the grade on the steel disks. The Mondex exactly parallels the action of the springs at all times, it is claimed.

A. V.—A Combination Principle

The A. V. shock absorber, Fig. 5, absorbs both the light and heavy shocks by means of a combination of hydro-pneumatic cylinders and supplementary springs. One model of this shock absorber is designed for attachment to the outside spring shackles front and rear and another type is made for fitting to the inner ends of the front and rear springs. Special types are made for trucks. In the action of the A. V. resistance to the spring movement is obtained by the compression of air, of two concentric helical springs and by forcing oil out through small orifices. The pneumatic effect is given by the telescoping of the upper and lower halves of the casing. This movement also causes the small piston in the center of the casing to displace some oil, forcing it into the outer casing through several holes.

These shock absorbers are made in France and are imported by the Hudson Export & Import Co., New York City.

B. & R.

The cushion spring manufactured by the B. & R. Shock Absorber Co., Philadelphia, Pa., is an unusual design, Fig. 6. Its main member is a spiral spring of five convolutions made from flat steel stock of about the same cross-section as the average leaf spring. The axis of the center is parallel to the spring shackle bolts. This peculiar construction is said to give the spring a very soft action. The improvement in this year's model is in the method of winding the spring, it now being wound eccentrically so that when the spring is loaded the convolutions are evenly spaced. The price per pair is $40.

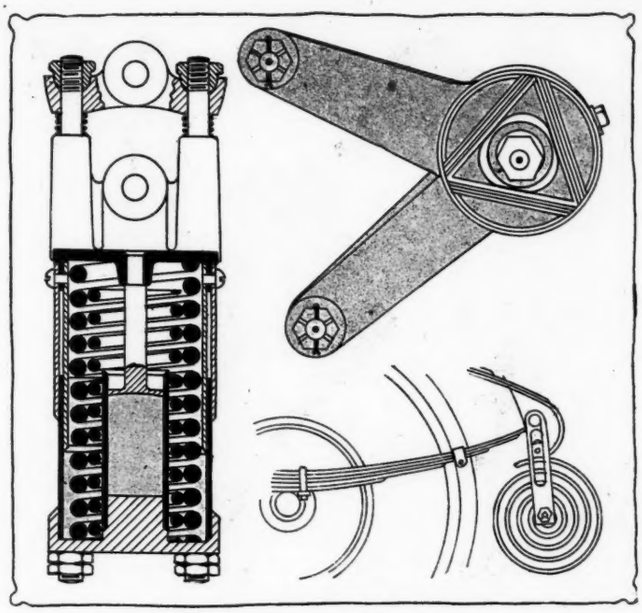


Fig. 5—Left—A. V. shock absorber. Fig. 6—Bottom, left—B. and R. cushion spring. Fig. 7—Top, right—Connecticut shock absorber

Connecticut—Cam and Spring Friction

No improvements have been found necessary in the shock absorber put out by the Connecticut Shock Absorber Co., Meriden, Conn. Friction is the basis of operation of this device, Fig. 7, which is made up of two arms that are pivoted to the leaf spring and the car frame. Inside the casing of the shock absorber there is a three-faced cam that bears against as many sets of flat springs, the pressure of the cam producing friction between the springs and the casing. The cam action is progressive, so that the shock absorber offers a resistance to the spring movement proportional to its amplitude. A sheet of anti-friction metal is placed between the cam and the springs and the housing is packed with grease to minimize wear. Provision for cars of various weights is allowed for by using springs of different strengths.

Cox—Takes Place of Shackle

The Cox Brass Mfg. Co., Albany, N. Y., has recently brought out a shock absorber of the cushion spring type, Fig. 8. It consists of two helical springs suitably incased in individual steel cylinders and is designed for attachment to the rear springs, taking the place of the shackles. Besides this, the company is continuing to manufacture the Rebound E-zer. The latter also employs a spring in its operation but in this case only one spring is used and this is mounted in a steel housing on the frame. The spring is actuated by a strap fastened to the axle. Cox shock absorbers are made for all sizes of cars and vary in price from $25 to $35, while the Rebound E-zers sell for $15 per pair.

Flentje—Automatic Adjustment to Road

The valve, piston and stuffing box have been improved in the 1914 Flentje so that the operating fluids, air and oil, are so combined that over fairly smooth roads the action of the air only is required while over very rough roads the oil is used. Another change in the new models is in number of oil holes used, four being employed now instead of the three formerly used. Flentje shock absorbers, Fig. 9, are designed for attachment to both front and rear springs and are fitted right over the axles. They are manufactured and marketed by Ernst Flentje, Cambridge, Mass.

Gabriel—Prices Cut in Half

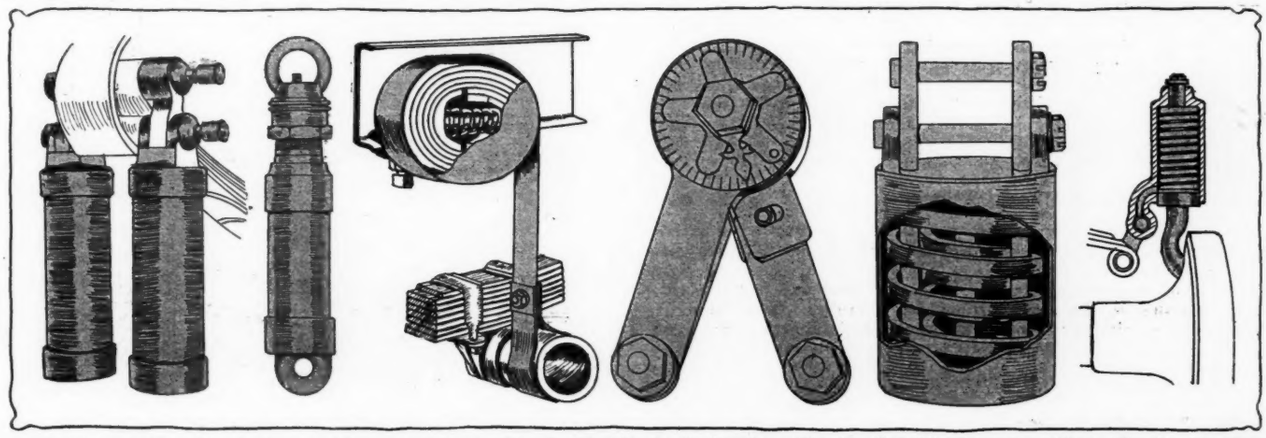
The big feature about Gabriel shock absorbers, Fig. 10, or rebound snubbers, as they are styled by the company, is that the price has been cut in half on all models.

Among the improvements effected in the construction, is the use of an improved fabric that possesses greater tensile strength and wearing qualities. A new bracket has been designed that permits the installation of the rebound snubbers on either side of the car without reversing.

Gabriel rebound snubbers are made in three sizes for pleasure cars and two for trucks. The prices on the pleasure car models vary from $12.50 to $17.50 per pair, depending on car weight, and truck types sell for $20 and $25 per set.

Hartford—Absorbers and Cushion Springs

The Hartford Suspension Co., Jersey City, N. J., makes a new friction shock absorber, Fig. 11, which automatically provides three adjustments and in addition it manufactures a cushion spring, Fig. 12, for attachment to the rear shackles. This new device does not take the place of the regular shock absorbers but supplements their action. It is merely a coil spring in a steel



From left to right:—Fig. 8—Cox cushion spring type. Fig. 9—Flentje shock absorber. Fig. 10—Gabriel rebound snubber. Fig. 11—Hartford shock absorber. Fig. 12—Hartford cushion spring. Fig. 13—K-W road smoother

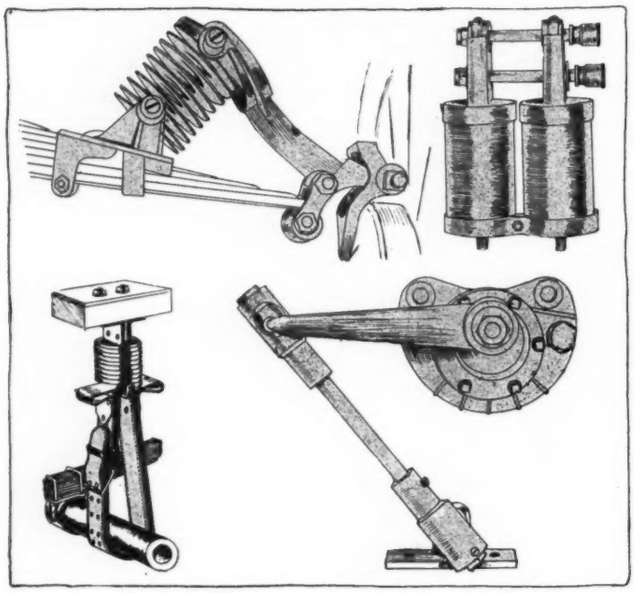


Fig. 14—Top, left—Hassler shock absorber. Fig. 15—Bottom, left—Hoover rebound check. Fig. 16—Top, right—J. M. shock absorber. Fig. 17—Bottom, right—Eclipse shock absorber

case and is designed to provide greater flexibility when traveling over small ruts and bumps, where the action of the wheel is too rapid for the main or car spring.

The new shock absorber supplies three degrees of flexibility for corresponding variations in road smoothness. The first is only slightly effective; the second doubles the amount of the first and comes into play on a rougher road, and the third comes into play only on a very bad road.

The Hartford absorber operates on the friction principle, the progressive resistance offered by it to the movement of the spring acting as a brake on the body movement. An adjusting dial is provided for accommodating the shock absorber to the weight of the car and a compensating spring fitted for taking up wear.

Hassler—Spiral Spring Design

A new shock absorber, Fig. 14, has recently been put on the market by Robert H. Hassler, Indianapolis, Ind., which, although of the spiral spring type, is quite original in its design. At present it is only made for Ford cars, although plans are under way for making similar shock absorbers for other makes of passenger cars and trucks. This shock absorber consists of an arm that is pivoted on the end of the car spring, the shorter end of the arm being fastened to the axle and the longer end acts on a helical spring that is located on the axle. By thus multiplying the movement a softer spring can be used and for this reason the spring is made of very flat, soft steel stock. Hassler shock absorbers are sold for $30 per set of four.

Eclipse—A Novel Type

A novel shock absorber, Fig. 17, known as the Eclipse, is made by Herz & Co., New York City, in which the resistance necessary for the absorption of spring vibrations is produced by the swinging of a steel lever in a specially compounded substance, which is inclosed in a cast-iron box attached to the frame. The special merit of this device, it is claimed, is that its action is proportional to the severity of the spring movement. Another feature is that the possibility of breaking a spring is eliminated because sharp spring movements are prevented.

Hoover—Spring and Strap Principle

No change has been made in the shock absorber, Fig. 15, brought out by the W. H. Hoover Co., New Berlin, O., last year. The construction of this device is very simple consisting of a spring that is bolted to the car floor or frame and a connecting strap running to the axle. The upward motion of the body is limited by auxiliary straps that are fastened at the lower end to the center of the main strap and at the upper to the flange that bolts to the car body. A special shock absorber is made for Ford cars.

J. M.—Made Up of Two Units

The J. M. shock absorber, Fig. 16, is made in France and imported by Locke & Co., New York City, employs a helical spring to obtain the cushioning effect. The spring is housed in a steel cylinder and either one or two units can be used to make up the complete shock absorber. Both single and dual types are made in three sizes for different car weights and, besides, a special model has been brought out for attachment to Ford automobiles.

K-W—Especially for Ford Cars

A cushion spring that is designed for Ford cars exclusively has been brought out by the K-W Ignition Co., Cleveland, O. It is known as the K-W Road Smoother, Fig. 13, and consists of a suitably incased spiral spring that replaces the regular spring hanger. The action of this device is to absorb jolts that are too small for the large springs to take up. The set of four can easily be applied to a Ford car in from 1 to 2 hours because no special fitting is necessary, the new cushion spring hangers being bolted in the place of the old ones. High grade steel is used in the springs and the hangers are drop forgings. The price, per set of four, is $25.

Le Telesco—Hydraulic Spring Combination

No modifications have been made in Le Telesco shock absorber, Fig. 18, for 1914. It is a combination type, a hydraulic spring shock absorber, the spring cushioning the blow when the car drops into a hole and the hydraulic action coming into play when the car spring is compressed. The Telesco consists of two steel cylinders arranged side by side and bolted to the lower car spring member, and two pistons connected to the upper spring member of the car frame, as the case may be. The helical spring is located between the upper side of the piston and the top of the cylinder. When the piston ascends a concentric valve opens and allows the liquid to flow freely so that the resistance to motion in this direction is due entirely to the spring. But when the piston starts downward this valve automatically closes and the liquid is obliged to pass through three small holes in the piston, thus giving the cushioning effect. These shock absorbers are made in six sizes by the Le Telesco Co., Baltimore, Md., and sell for from $50 to $60.

Mitchell—Exclusively for Ford Cars

No change has been made in Mitchell shock absorbers, Fig. 21. They are made for Ford cars exclusively and consist of a helical spring attached to the axle and a connecting strap that runs to the frame. The top of the spring terminates in a clamp that goes around the axle and the lower end of the spring has a plate on it to which the strap is attached. Mitchell shock absorbers sell for $7.50 per pair and a set of four are $12. These shock absorbers are now made and sold by the Motor Specialties Co., Waltham, Mass.

Martin—Friction Type Absorber

A few small improvements have been made by the Martin Shock Absorber Co., Los Angeles, Cal., in their product for 1914. This absorber, Fig. 19, is a frictional type in which an

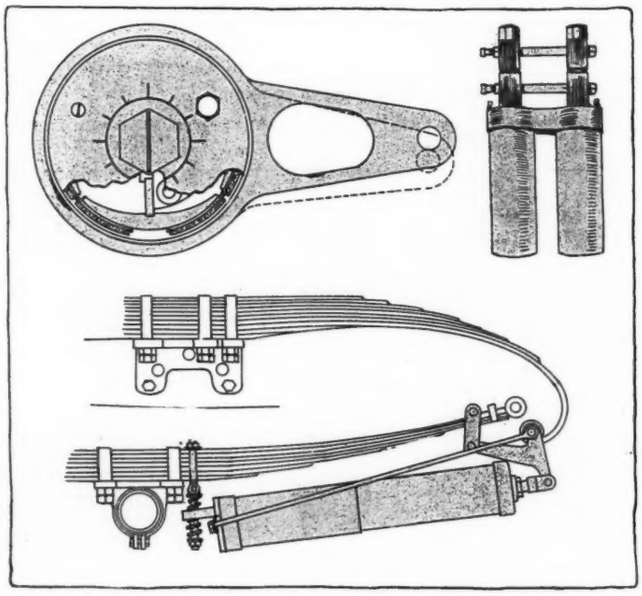


Fig. 18—Top, right—Le Telesco cushion spring. Fig. 19—Top, left—Martin shock absorber. Fig. 20—Bottom—Overman shock absorber

expanding shoe acts on a drum. An improved method of attaching the leather friction linings has been adopted, doing away with the rivets formerly used. This change not only removes any possibility of metallic contact between the drum and the shoe but it provides an easier method of replacement. A change has also been made in the method of maintaining automatic adjustment.

Overman—Combination Spring and Air

In the Overman absorber, Fig. 20, a series of concentric helical springs is used, assisted by a pneumatic action that occurs near the end of a full stroke. The Overman is a combination spring and pneumatic type. Ordinarily, the action of the shock absorber is dependent on the compression of three concentric, helical springs but when the axle movement is very great the compression of air by a piston located in the steel case assists the spring action. This cylinder is in line with the axle and one end is fastened to it. The method of connecting the shock absorber to the spring is novel, the piston rod being pinned to an arm pivoted to the spring hanger, and the other end of the arm fastened to the spring member. Thus any vertical movement between the spring and the frame results in a horizontal displacement of the piston rod. The Keasbey Shock Absorber Co., New York City, is the sole licensee for the United States.

Peteler

No alterations or improvements have been made, for 1914, in the hydraulic shock absorber brought out by the Peteler Shock Absorber Corp., New York City, last July. The Peteler, Fig. 22, uses oil as a working fluid, the oil resisting the movement of a two-bladed paddle moving in a cylindrical case, which is fastened to the car frame by an arm about a foot long. The paddle is actuated by another arm that is bolted to the axle. The interior is divided into four chambers when the shock absorber is in its normal position, by this paddle and a partition that is at right angles to the paddle when the shock absorber is in this position. Therefore, when a shock is experienced, the movement of the paddle creates a high pressure in one pair of diagonal chambers and simultaneously the pressure is reduced in the other two. Pressure is relieved by a spring-loaded piston located at the center of the shock absorber, the spring compressing as the oil pressure increases. This design, it is said, gives a shock absorber that offers a resistance proportional to the amplitude of the spring movement and greatly softens the jars experienced on rough roads. Adjustment is provided for regulating its action according to the weight of the car.

Powers—An Auxiliary Spring Device

A recent addition to the shock absorber field is the auxiliary spring, Fig. 23, produced by the Powers Spring Co., New York City. Models are made for attachment to both the forward end of the front spring and the back of the rear spring. Two heavy

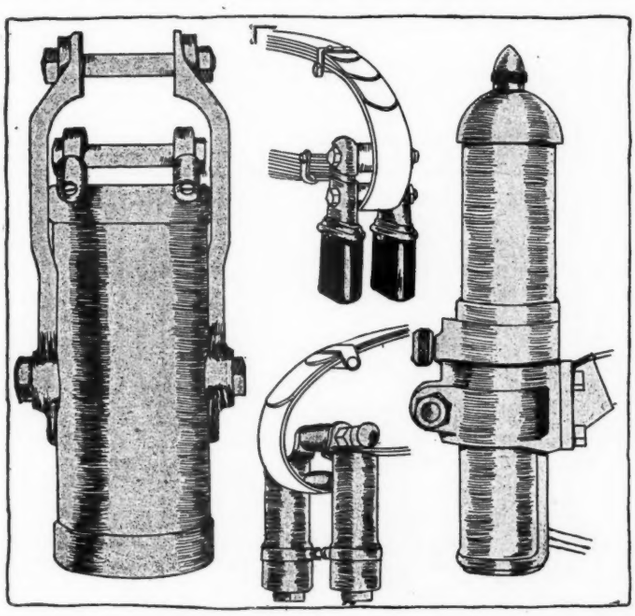


Fig. 25—Bottom, middle—Sager cushion spring. Fig. 26—Left—Universal shock eliminator. Fig. 27—Top, middle—Velvet shock absorbers. Fig. 28—Right—Westinghouse air spring

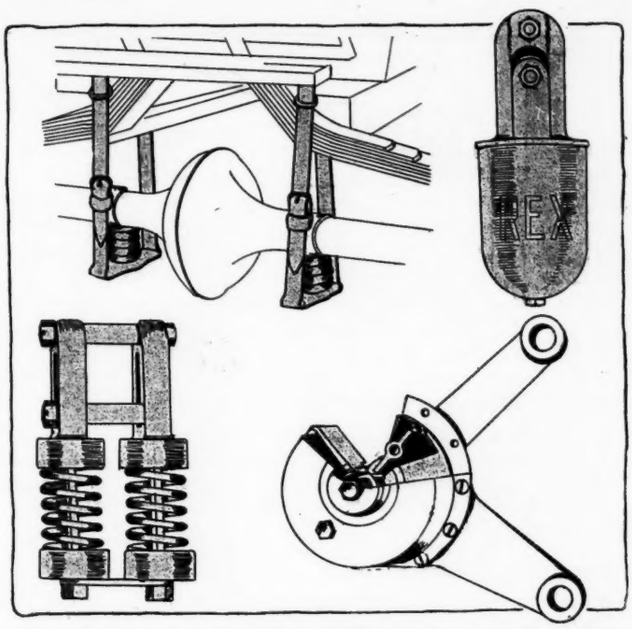


Fig. 21—Top, left—Mitchell rebound checks. Fig. 22—Bottom, right—Peteler shock absorber. Fig. 23—Bottom, left—Powers spring cushion. Fig. 24—Top, right—Rex spring cushion

helical springs are used in each shock absorber and their action is such as to absorb the unpleasant vibrations that are ordinarily transmitted to the car body. Powers' shock absorbers are offered in three sizes, light, medium and heavy, and sell for $35, $37.50 and $40, respectively.

Rex—Has New Kind of Spring

A shock absorber with a new type of spring is made by John G. Rock & Co., New Rochelle, N. Y. In this design, Fig. 24, a spring of the true spiral type is used and it is claimed that it furnishes a progressive action depending on the character of the road and the speed at which the car is traveling. The spring is housed in a deep bowl-shaped casing. These shock absorbers are designed to be attached to the rear spring shackles and are capable of being fitted to all types of springs.

J. H. S.—Helical Spring Cushion

A new shock absorber, Fig. 25, known as the J. H. S., has been put on the market by the J. H. Sager Co., Rochester, N. Y., recently. It is a helical spring cushion type in which the spring is housed in a suitable steel casing. Either one or two units, depending on the weight of the car, go to make up the complete shock absorber which is attached to the spring shackles, only one being used on a very light machine. The barrels used in the construction of these absorbers are the same size for all machines, but springs of different gauges are fitted depending on the weight of the car. In addition to this new model, the Sager equalizing springs that have been on the market for several years are continued.

Universal—Has Heavy Helical Spring

A new absorber, Fig. 26, has recently been put on the market by the Universal Shock Eliminator Co., New York City. It embodies a heavy helical spring inclosed in a steel housing in its construction. The shock absorber takes the place of the spring shackle and is easily attached by simply putting the one in the place of the other. A special type is made for cars with platform springs. Universal Shock Eliminators are sold for $40 per set.

Velvet—Spring Type of Absorber

A special shock absorber for Ford cars is the feature of the Velvet line manufactured by the John Blackledge Mfg. Co., Chicago, Ill. Its appearance is similar to the larger Velvet models and its construction is the same. The Velvet shock absorber, Fig. 27, is a spring type in which two spiral springs are located in a flat telescopic case one each side of the spring shackle.

Besides the new Ford model, there are six sizes of shock absorbers made for cars varying in weight from 2,200 pounds and under, up to over 4,800 pounds. The price of the Ford type is $22.50 and the other models sell for $35 per set.

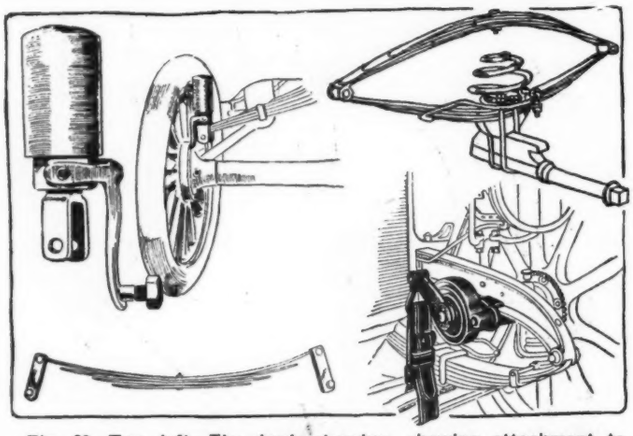


Fig. 29—Top, left—Ely shock absorber, showing attachment to a Ford. Fig. 30—Bottom, left—Anderson auxiliary spring. Fig. 31—Top, right—Falkenheimer spring bumper. Fig. 32—Lower, right—Skinner shock absorber

Westinghouse—Makes Two Models

The Westinghouse Air Spring Co., Pittsburgh, Pa., is making two models of air springs, one for trucks and one for passenger cars. The device, Fig. 28, made by this concern consists of a telescopic cylinder that can be attached to the front or rear spring shackles.

The interior consists of two chambers, the upper containing air and the lower oil. It is impossible to go into the details of construction, but in its most elementary form the air spring would consist of two deep cups telescoping into each other. If the chamber formed by these contained air alone it would resist compression much as an ordinary helical spring. But, if at the same time, the volume of the space the air occupies were reduced then the resistance offered by telescoping the two cups would increase at a greater rate than if the volume were unchanged. To accomplish this the interior is divided by a piston, the upper chamber containing air and the lower one oil. This piston is so constructed that when the two cups are forced together oil is injected into the air space, thus reducing the volume and increasing the pressure, and in this way a progressive action is obtained, one that is delicate enough to absorb the small bumps, but at the same time has capacity enough to cushion the big ones as well.

Halladay Shock Absorber

A shock absorber especially designed for application to the Ford car and especially appealing to the Ford owner's pocketbook is the Halladay shock absorber, Fig. 35, the product of the L. P. Halladay Co., Streator, Ill. It consists of a coil spring incorporated within a small metal housing and standing vertically. The axle ends of the spring shackles are attached to one member and the other member is bolted directly to the axle. The use of the Ford shackle is a feature of this shock absorber in that any side motion is taken up by the shackle and there is no tendency of the absorber to wobble sideways. The absorbers are adapted for both front and rear of the car and a set of four is listed at $12.50.

Ely Shock Absorber for Fords

Another shock absorber, Fig. 29, designed particularly for Fords is the Ely, manufactured by the Donnelly Motor Equipment Co., New York City. This is of the coil spring type inclosed in a dust and waterproof casing and is intended to be inserted between the axle and the spring replacing the shackle. The inverted mounting of the casing is noteworthy and it is claimed that it is this feature that renders the interior immune to dust and moisture. They sell for $12.50 per set of four.

Andersen Shock Absorber

The Andersen shock absorber, Fig. 30, consists of an auxiliary spring construction which is designed for attachment to any motor car springs already on cars. The absorber is made of the same sized steel as the spring to which it is attached and consists of four leaves bolted together at the center and gradually separating toward the end. In normal position the ends are 1-4 inch away from adjoining leaves. The absorber is attached to the top of the spring and becomes a part of it, each end of the top leaf being provided with an I and to this is attached an iron clip which passes under the main spring.

In its action this auxiliary spring absorber acts as a dampener of the rebound of the main spring just as any other type of shock absorber would. When the car hits a rut the spring travels downward and engages the clips of the Andersen device and therefore takes hold of the upper leaf of it. The greater the depression of the main spring the greater the number of leaves of the absorber that are brought into action. In the upthrow of the car the upper leaf of the main spring is drawn upward and immediately engages the lower leaf of the absorber which in this case remains stationary, engaging others of the auxiliary leaves in proportion to the upthrow of the main spring and thus checking the rebound action of the car. Thus, whatever the extent of the movement of the main spring enough of the absorber leaves are brought into play to resist its movement although the resiliency of the springs is obviously not hampered. The Andersen Spring Co., Detroit, Mich., makes this device.

Falkenheimer Spring Bumper

A coil spring bumper, Fig. 31, is produced by Falkenheimer, Falkenheimer & Co., St. Louis, Mo., to take the place of the rubber bumpers so often employed for the prevention of too great a movement of the car springs. The method of attachment is simple and the price is low, ranging from $1 to $1.25 each. It is claimed that these bumpers are more durable than the rubber type and also that their action in limiting the spring movement is less severe because they are more resilient than solid rubber.

Cushionet Shock Absorber for Fords

The Walker-Moore Mfg. Co., Racine, Wis., is making a special coil spring for Ford cars. It is known as the Cushionet and lists at $10 per set. Looking at Fig. 34 it is seen that the spring consists of an open coil of three turns of heavy stock, one end being clamped to the axle and the other to the frame. It is stated that the complete set can be installed in less than 30 minutes and that there is not a single hole to drill or bolt to remove.

Johnson Shock Absorbers

The Johnson shock absorber, Fig. 33, is of the spring cushion type interposed between spring shackles. It consists of two coil springs, one within the other. One is of heavy stock and is stiff to take heavy shocks and the other is a re-coil check. These are encased within a water and dust-proof cylinder. In the center of them is an adjustment bow, the adjustment being made by a nut at the bottom of the cylinder, and can vary to a range of 1,000 pounds. A special type is marketed by the Triple Action Spring Co., Chicago, for Ford cars at $22.50 for a set of two. Four different sizes are provided giving a range of vehicles as heavy as 5-ton trucks, for which $50 per set is asked.

Skinner Shock Absorbers

An interesting departure in shock absorber design is exemplified in the Skinner, Fig. 32, which is made by the Mayo Mfg. Co., Chicago, Ill. It embraces a flat spirally coiled spring whose outer end is bolted to the frame and whose inner end has an arm attached to it which connects to the axle by means of a stout leather strap. The features claimed for the Skinner are simplicity and a progressive action. The parts are few and there is very little chance for wear to occur. Another point of superiority claimed for this device is ease of attachment. The spring bolts to the frame by means of an adjustable clamp and then the strap is buckled around the axle.

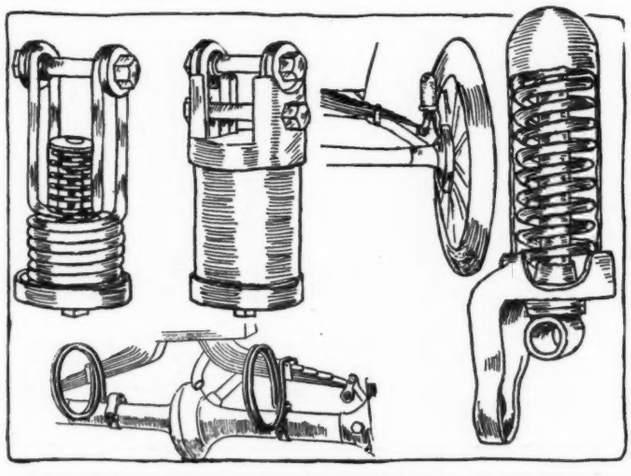


Fig. 33—Top, left—Johnson cushion spring. Fig. 34—Lower, left—Cushionet for Fords. Fig. 35—Right—Halladay cushion spring for Fords

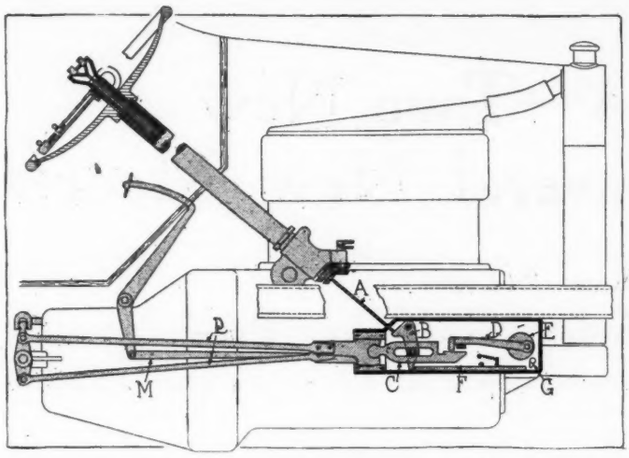


Fig. 1—Grand Rapids gearshift, showing push-button control on steering wheel. Note box containing shifting mechanism is in direct line with steering post

New Automatic Gearshift Driven By Engine

Made by Grand Rapids Show Case Co.—Uses Push Button Control—Light and Simple

A MECHANICALLY operated automatic gearshifting device, Fig. 1, has recently been brought out by the Grand Rapids Show Case Co., Grand Rapids, Mich. The gears are selected by push-buttons on the steering column and the power for speed changing is obtained directly from the engine by a bevel gear drive. The box containing the mechanism is located just forward of the base of the steering column, Fig. 1, so that the rods that are actuated by the push-buttons pass directly into the rear of the box.

When a button is depressed, and because of an interlocking device this can not be done until the clutch is released, two things happen: the shifting mechanism is brought into position for meshing the desired gear and then the clutch that connects the shifter with its drive shaft is engaged.

Engine Power Automatically Applied

The selector mechanism, Fig. 2, will be described first and then the method of automatically applying the engine power to move the gears will be taken up. From the rear of the shifting box, Fig. 1, four rods R extend back to the gearbox, one rod for each speed, there being four including reverse, and as will be shown, shifting is accomplished by pulling the desired rod to the right. Each of these rods has a mechanical connection with a corresponding button on the wheel. This connection, Fig. 2, is obtained through a rod A, a crank B and an arm C, the four sets being arranged one behind the other. Now suppose that some gear is engaged, then the coresponding arm B will be in a position to the right of the other three. If it is desired to shift to another gear, the correct button is pushed down and partially rotating the corresponding crank A and raising the arm B. As soon as this occurs the arm D moves to the left pushing the gear in engagement back to neutral and on the return movement the hooked end of the arm D drops into the slot of the raised arm C and pulls the gear, just selected, into mesh. The arm D is actuated by the rotation of the pin attached to the disk E, which is driven from the camshaft through a suitable clutch.

The operation of the tripping mechanism that throws this clutch in when a button on the wheel is depressed is as follows: The partial rotation of the crank A moves the member F to the right and thus actuates the cam or arm G. Now looking at Fig. 3, it is seen that the movement of this cam releases the trigger arm H, which in turn allows the dog clutch J to fly into engagement, impelled by the coil spring attached to the other arm of the trigger. The dog clutch member controlled by the trigger is slidably keyed to the driving shaft and is moved by a roller that fits in the collar on its back. As this clutch gives a positive drive something would break if the change gear teeth ever came together when not in alignment. For this reason, friction disks transmit the power from the driven member of the dog clutch to the sleeve on which the pin that reciprocates the shifting arm D is located. Adjustment of the pressure on these friction disks is maintained by the spring washer K and the nut L.

A Neutral Button Is Not Needed

No button is provided for neutral, although one could easily be fitted, because a gear can be brought to this position by holding down any button, except the one of the gear engaged, for about half the time necessary for a complete shift. The button is depressed long enough to allow the arm C of the gear in mesh to be brought back to neutral position but is released before the arm C actuated by the button is caught by the hooked arm D.

A locking device that is controlled by the rod M prevents gearshifting when the clutch is engaged.

The features of the Grand Rapids gearshift are its small weight and its simplicity. Gearshifting is easily and silently accomplished and its use enables a novice to handle almost as skilfully as an experienced man. Silence, in an automatic gearshift, depends on the speed with which the shifting is accomplished and in the Grand Rapids the movement is sufficiently quick to allow the meshing of the gears before the teeth have a chance to grate against each other.

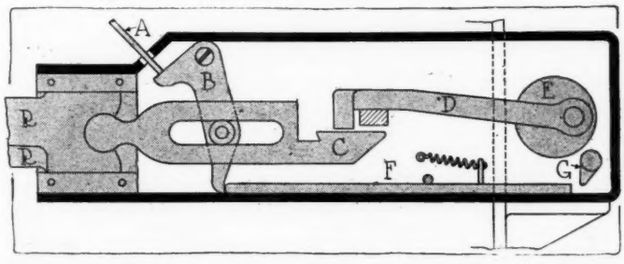


Fig. 2—Detail of shifting mechanism, showing rod A running from button on steering wheel. The downward motion of A rotating B to the right and thus raising C. Then when the cam G is tripped by the rod F the disk E rotates, reciprocating the arm D, which engages the arms C and accomplishes the shifting

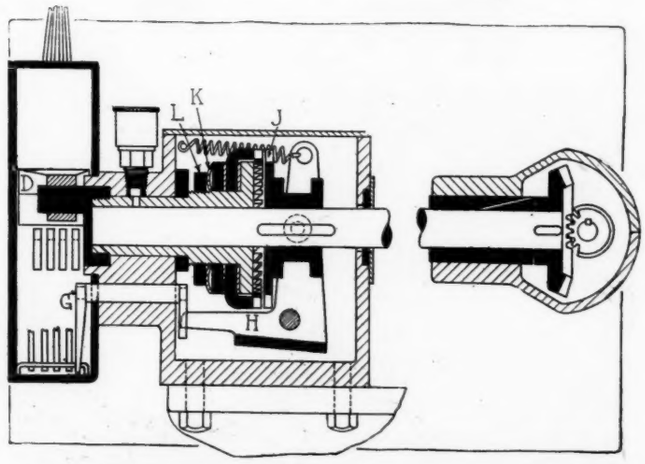


Fig. 3—Vertical section through driving mechanism. Bevel gear connection to the motor is shown at the right, the clutch in the center, and the crank for driving arm D at the left

Speedometers for 1914—Two New Makes—Several New Models

Elyria-Dean and Van Sicklen Are New—Warner Has New Model—Hoffecker Prevents Joy-Riding—Special Designs for Trucks

THE year 1914 has brought forth two new makes of speedometers: one, the Van Sicklen, based on an entirely new principle and the other, the Elyria Dean employing a centrifugal form of speed indicator. The former is also notable on account of the large figures used on the odometer dials and the taking of the drive from the clutch or propeller shaft instead of from the front wheel, as is customary. The features on the latter worthy of especial mention are the large, equally divided speedometer scale and the worm drive at the swivel joints.

Several new models are offered by the old concerns and a great many minor improvements have been made in the different makes; but, as is to be expected after all these years of development, nothing very startling has been put forward this year.

The Stewart-Warner Corp. has added a $40 model to their Stewart line and have also brought out a new hub odometer. A change has been made in the odometer drive on the Warner instruments. The Jones' extensive line has been augmented by one new design, a speedometer with a 30-mile dial. Another interesting development of this season is the Hoffecker speed-lock, an instrument that combines a speed-controlling device with an ordinary speedometer. A special Ford model has been designed by the American Ever Ready company and this concern has also made several little changes to increase the durability of its product.

More attention is being given year by year to the special needs of motor trucks and this season a variety of types are seen. A new hub odometer has been brought out by the Veeder company, and besides there is the Stewart hub odometer and the Jones. A recording speedometer is made by the Jones company and recording instruments that operate by vibration and therefore require no driving mechanism are manufactured by the Brown Trafilog and the Servis Recorder companies.

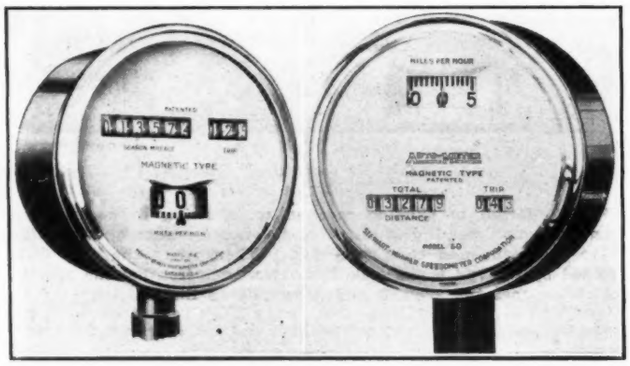


Fig. 1—Left—Stewart speedometer. Right—Warner auto-meter

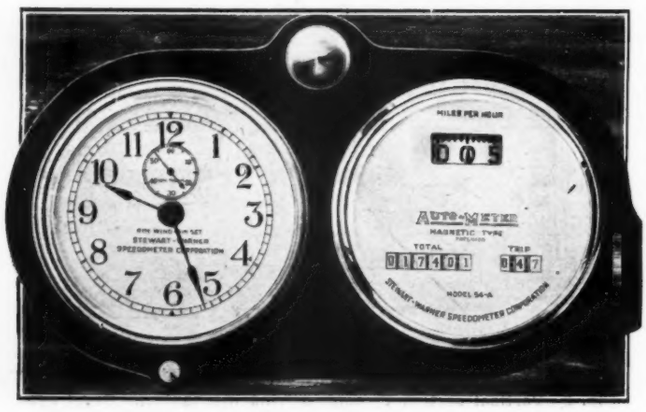


Fig. 2—Warner auto-meter, with clock for flush installation

Refinements in Stewart-Warner Line

Two new models have been added by the Stewart-Warner Corp., Chicago, Ill. One of these is the Stewart model G which sells for $40. It has a 60-mile dial and a 100,000-mile season odometer. It is made in horizontal combination with an 8-day clock and with flush-sided or projecting casing. Another new type for 1914 is the Stewart hub odometer, Fig. 14, which is used mainly on trucks and electric pleasure vehicles.

On the Warner instruments, the odometer is now driven directly; this feature taking the place of the ratchet drive of last year, an improvement that allows larger figures to be used on the season and trip odometers.

Both Stewart and Warner speedometers are made in a variety of models and prices. Clock combinations either with the clock at the side or above the speedometer are offered and these, as well as the simple types, are furnished with casings that permit their being mounted flush with the cowl board. Several models are electrically lighted. A combination clock and speedometer fitted to a cowl board is shown in Fig. 2 and a Stewart and a Warner with conventional bracket fastening are illustrated in Fig. 1.

Elyria-Dean Speedometer—A New Make

The Dean Electric Co., Elyria, O., has taken up the manufacture of speedometers and is offering instruments operating on the centrifugal principle. A general idea of the models produced by this concern is given by the one illustrated in Fig. 6. It has a 60-mile dial, a 100-mile trip and a 100,000-mile season odometer. The dial is finished in black, which contrasts strongly with the white lettering, making the figures easy to read.

The speed-indicating mechanism consists of a ball-race in which four steel balls are carried, and over which a steel cup fits. As the container rotates these balls are forced outward by centrifugal force against the inner curved surface of the inverted cup, raising it in proportion to the speed of rotation. This motion is transferred by a simple mechanism to the indicating hand on the dial. No compensating springs are used in the Elyria, and only one spring is found in the entire mechanism, this one being for the purpose of returning the hand to zero.

The scale covers three-quarters of a circle and is equally divided, the surface of the cup-shaped member being so curved as to make this possible.

Worm drive is used in the swivel joint and a twisted wire cable is employed to transmit the motion from the wheel.

Hoffecker Speedlock Prevents Joy-Riding

An interesting speedometer modification that not only limits the speed to any desired maximum but also acts as an auto-lock to protect the car from thieves has recently been brought out by the Hoffecker-Evans Co., Boston, Mass. It is known as the speedlock, Fig. 3, and consists of a conventional speedometer of the centrifugal type in combination with a movable disk on which there are a series of figures that correspond with those on the dial. By means of a Yale push key the disk is set at the desired speed and when the indicating hand of the speedometer reaches this figure the ignition current is short-circuited and thus the motor power is shut off until the speed drops below this maximum.

The advantages of the speedlock are many. In the first place reckless driving by either the chauffeur or younger members of the family can easily be prevented by setting the lock at whatever speed is considered safe. By setting the disk at zero the car can not be moved at all and therefore the danger of it being stolen is eliminated. Moving the car about the garage is facilitated by its use as it can be set at 5 miles per hour allowing the car to be run to and from the wash-rack and permitting it to be taken from the garage in case of fire and yet there is no possibility of the attendants joy-riding because the speed is limited to 5 miles per hour. Three speedometer models are made by the Hoffecker company, one with a 60-mile indicator, and 50-mile trip for $15, another with 75-mile indicator, and 100-mile trip for $50 and a special clock combination for $125. All three have 100,000 mile trip odometers. The first two models are furnished with a speedlock for $15 additional and the last has the speedlock included in its price.

Van Sicklen Speed Meter—A New Type

A speedometer, Fig. 4, operating on an entirely new principle has been put on the market by the Van Sicklen Co., Aurora, Ill. It is very simple in its construction, the speed indicating mechanism being so designed that it is not affected by wear or change of temperature, nor will it vibrate to even the slightest degree no matter how rough the road or how high the speed, it is said.

Another feature is the odometer in which visible gears, ratchets and springs have been eliminated giving full dial width for large sized figures that can easily be read from the rear seat of a seven-passenger car. All dials are made from a non-corrosive metal enameled a dead, non-glistening white and the numerals are lithographed on them in 1-4-inch full face figures.

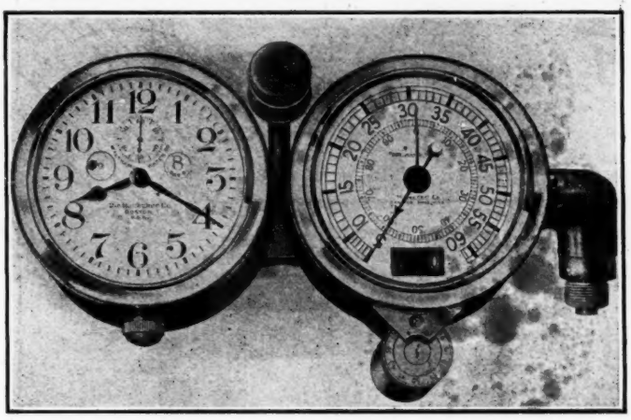


Fig. 3—Hoffecker speedometer fitted with speed lock and combined with 8-day clock

Instead of driving from the front wheel the Van Sicklen is operated from the clutch or propeller shaft by means of a wire cable running over grooved pulleys. The design is such that slippage has been eliminated.

American Ever Ready Has Ford Special

Few changes and no new models are noticed in the Ever Ready line for 1914. One new feature is the adaptation of one of its models to the special requirements of the Ford car. A special set of fittings has been designed for this model and the price is well within the reach of the Ford owner.

Improvements have been made in the odometer construction by eliminating some of the springs and cams and the numerical disks are now made with white faces, so that the figures show more plainly.

A full line of instruments is made by this concern, giving a wide choice not only in types but prices as well. The smallest model has a 2 5-8-inch dial, a 60-mile speed range, and a 10,000-mile odometer and sells for $15. The most expensive type is a speedometer-clock combination that sells for $40. In this model the clock is arranged above the speedometer. The clock is capable of running 8 days, while the speedometer hand registers up to 80 miles. Another design in which the two dials are placed side by side sells for $35. All speedometer-clock combinations are electrically lighted. A popular model is illustrated in Fig. 5. It is equipped with season and trip odometers, and an 80-mile dial. It sells for $25, but a similar style with a 50-mile speed range retails at $20.

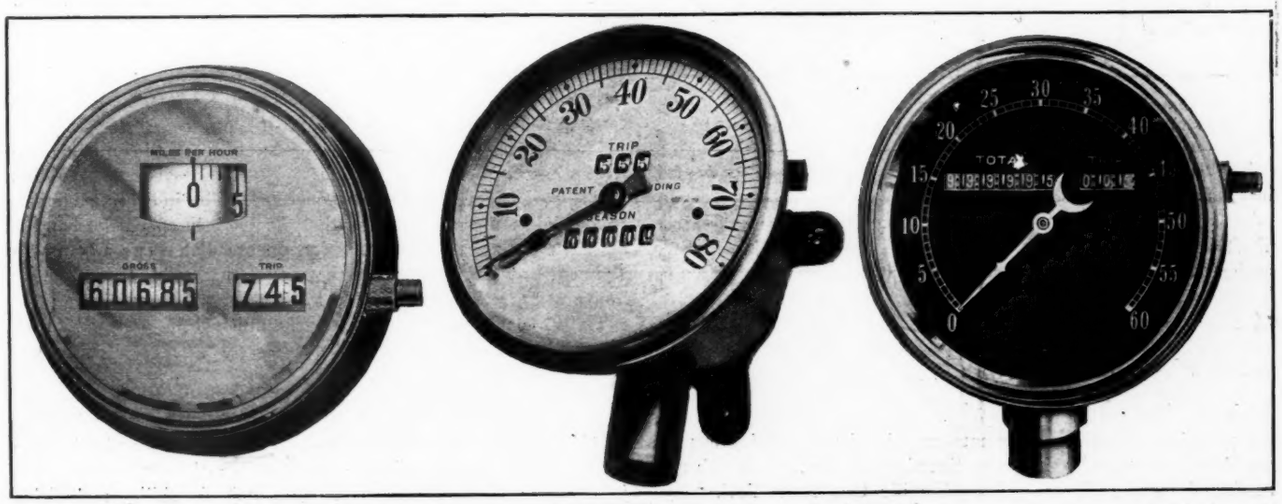


Fig. 4—Left—Van Sicklen speedometer. Note large figures used. Fig. 5—Center—American Ever Ready, with 80-mile dial. Fig. 6—Right—Elyria-Dean, with black dial

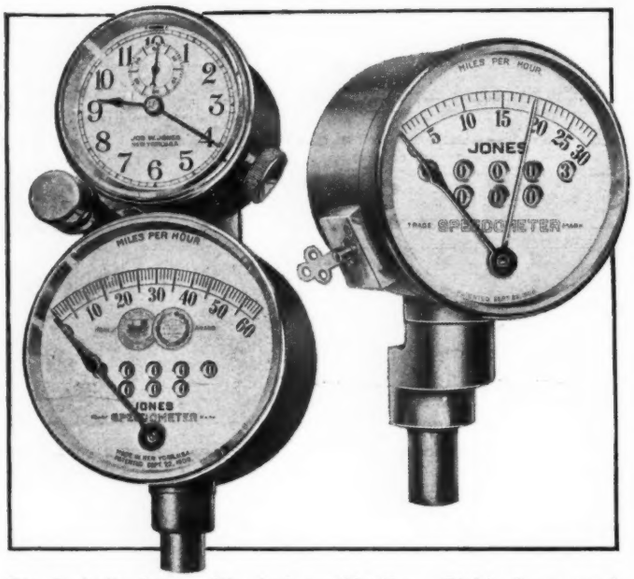


Fig. 7—Left—Jones with clock combination. Right—Jones maximum hand type

Fig. 8—Top—Reliance electrically lighted clock combination. Fig. 9—Bottom—Corbin-Brown clock and speedometer model

The Ever Ready operates on the magnetic principle, powerful magnets being used so that the hand will remain steady even when road vibrations are severe. The construction of the flexible shaft is interesting. It is made up of sixteen strands of wire, each four strains coiled in reverse directions so that a tough, flexible driving member is the result. One noteworthy feature of the drive is that a fiber pinion cam is furnished when extreme silence is desired. These speedometers are made by the American Ever Ready Co., New York City.

Larger Figures on Jones Models

Up-to-the-minute improvements are the features of the 1914 speedometers made by the Jones Speedometer Co., and which are marketed by the H. W. Johns-Manville Co., New York City, through its comprehensive system of branches. Externally the principal point of difference is the larger figures on the speed dial which are easily readable from the tonneau. Among the new models is a special instrument with a 30-mile dial, Fig. 7, for use on electrics, the advantage being that the scale is larger and therefore easier to see.

The Jones automatic recorder for use on trucks is continued. This instrument shows the movement of the truck with respect to time and thus enables the owner to keep track of the driver's movements. In other words the speed of the truck each day and the number and length of the stops are indicated on the chart.

The Jones autolog is a special instrument that is designed for the tourist who desires an exact record of the speed maintained on a run. It consists of a chart on which a pencil arm operated by the speedometer mechanism marks a line that shows all the minute variations in speed. Above this dial an ordinary indicating speedometer is mounted.

Other models include the maximum hand type which shows the maximum speed attained on a run and the hub odometer which as its name implies is a mileage register attached to the hub. This is illustrated in Fig. 14.

The features that have been continued in the Jones line include the flexible wire cable drive in which a flexible steel core is wound with sixteen strands of piano wire, and the quick method of resetting the trip odometer to zero by pushing a button once.

The Jones line offers a wide choice of models, from the $20 style with a 3-inch face and a 60-mile indicator to the clock combination with an 80-mile range and selling for $125.

Reliance Has Calibrated Dial

The speedometers turned out by the Reliance Speedometer Co., Boston, Mass., are offered in two models, one with a 60-mile dial and the other with a 75. Both types are furnished with clock attachment either at the side or top. Electric illumination is optional on the simple speedometers but is regular equipment on the combination types. A 60-mile combination selling for $90 is shown in Fig. 8. One of the features of the Reliance is the indicating hand for registering trip mileages. This hand and the dial are colored green to make them easily distinguishable from the speed-indicating mechanism.

Accuracy of the speed hand is insured by calibrating each instrument separately. The speedometers are delivered from the testing room with the speed indicating dials blank. The graduations are marked by running each instrument in a testing machine and putting them on with exact reference to the performance of each individual machine.

Corbin-Brown Speedometers Unchanged

Not a single change has been made for 1914 in the speedometers put out by the Corbin Screw Corporation. In all, eight models are offered, ranging from the 3-inch 60-mile style that sells for $25 to the 100-mile clock combination that retails for $120.

One of these instruments is shown in Fig. 9, a combination clock type having a 100-mile trip and 100,000-mile season odometer and capable of registering speeds up to 60 miles per hour. Chelsea 8-day clocks are used on all models.

The Corbin-Brown speedometers are operated on the centrifugal principle. Four balance weights are arranged so that as the speed increases they fly outward. The indicating hand is connected to these weights so that for a given speed the hand is made to assume a certain position on the dial. The advantages claimed for this system are that it is not susceptible to changes in temperature and is not affected by electrical influences.

These speedometers are regularly finished in polished brass, nickel plate or in nickel and black.

Standard Has Some Refinements

No great changes but a few detail improvements tending toward increased efficiency have been made by the Standard Thermometer Co., Boston, Mass. For instance, the shafts and pivot joints are now hardened to increase their durability and nickel steel is used wherever possible for the same reason.

The Standard line comprises a variety of models. The small-

est type is the 3-inch speedometer that sells for $25. Several types with 4-inch faces are made and both 3 and 4-inch sizes are furnished with clock combinations.

One of the best-known models is illustrated in Fig. 11. It is electrically lighted and is bracketed to the dash. The minimum speed range on these speedometers is 60 miles and some types are equipped with an 80-mile dial; a special slow speed design for electrics and trucks with a 40-mile dial is made however.

A sliding weight centrifugal governor with a counterbalancing rack is used in these speedometers and it works equally well whether the instrument is in a horizontal or vertical position.

Brown Trafilog for Trucks

An interesting instrument, Fig. 12, designed for trucks and which gives a complete record of a machine's movements throughout the day is made by the Brown Trafilog Co., Cleveland, O. It is a self-contained machine operating by the vibration of the car and therefore does not need a driving mechanism. It consists of an 8-day clock movement which drives a 24-hour or 8-day chart. On this chart a vibrating pencil draws a smooth or broken line depending on whether the truck is in motion or not. This record shows the time and duration of stops made during a trip or throughout the whole day and thus indicates the efficiency of the driver.

All parts are inclosed in a pressed steel case which measures 7.5 inches in diameter by 3 inches deep. The face of the instrument is made either of glass or steel as desired. A Yale lock protects the Trafilog from being tampered with.

Veeder Introduces Hub Odometer

The only addition for 1914 to the instruments put out by the Veeder Mfg. Co., Hartford, Conn., is a hub odometer; the other models offered are the same as those for 1913.

The new odometer, Fig. 10, takes the place of the hub and is only slightly larger than it. The drive is obtained by a small pin that is inserted into the end of the axle shaft. There are six dials, one of which indicates tenths so that it is possible to read up to 100,000 miles by tenths. The case of the odometer proper is made of heavy drawn brass .25 inch in thickness so that there is little possibility of injury to the instrument. The figures on the dials are made of fused porcelain enamel and the gear movement is manufactured from brass and bronze. The whole mechanism is sealed so that no dirt can get in.

The Veeder company also makes odometers that are driven through a flexible shaft, and can be located on the dash. These are similar in their principles of construction to the hub design. A new pinion is used on these instruments that is of special interest because it is made out of a single piece of sheet steel, the teeth being formed by stamping them in the edge. In the stamping operation, the edge is divided up into sections corresponding to the number of teeth in the pinion and then each of these sections is twisted around at right angles, thus forming a tooth.

Veeder speedometers, or tachodometers as they are designated by the company, use a hydraulic form of speed indicator, which consists of a glass tube in which there is a colored liquid whose level depends upon the speed of the car, a suitable scale being attached to the tube to show the exact speed. The liquid is set in motion by a positively driven paddle wheel in the body of the instrument, and the faster the wheel rotates the higher the liquid mounts in the tube. If for any reason the liquid does not stand at zero when the car is standing still the level can be brought to the zero point by turning an adjusting screw that operates a displacement plunger.

Servis Recorder Uses Pendulum

An instrument, Fig. 13, for recording the travel and stops, and therefore checking up the efficiency of the driver is manufactured by the Servis Recorder Co., Cleveland, O. The service recorder is entirely independent of the running gear of the car. The oscillations of a pendulum which are caused by the motion of the vehicle are recorded on a time chart of sensitized paper. The clock mechanism that drives the chart is an 8 day Seth Thomas movement built to withstand vibration and is well protected by a sealed housing.

The timing and recording mechanism is inclosed in a metal case under lock and key and an additional safeguard against meddling or tampering is afforded by a little device that punches a hole in the chart every time the door is opened or closed.

Fig. 13—Left—Servis recorder for trucks. Fig. 14—Right—Stewart hub odometer

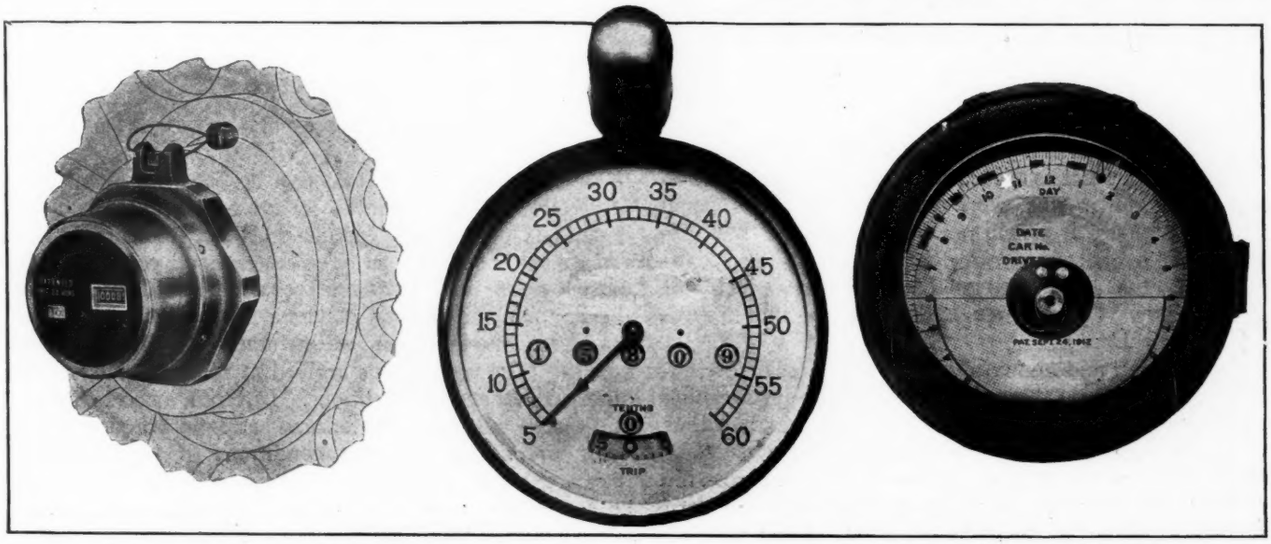


Fig. 10—Left—Veeder hub odometer. Fig. 11—Center—Standard with 60-mile dial. Fig. 12—Right—Brown Trafilog

The Automobile

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Developing Hidden Forces

BY erecting a clubhouse for its working women and men, not its officers, factory superintendents and heads of departments, but for its laboring forces with these others included, the Republic Rubber Company has started a movement which deserves every consideration at the hands of other factories.

The club is a new factor in handling employees. The club for heads of departments is not new. Many factories have had officers' clubs. Clubs of inspectors in factories are not new. But the working club is new. Here is a club for the man who attends to the machines in the factory, here is a club for the man who works in the accounting department, here is a club for the man who works in the raw stockroom, in the finished stockroom, or in the power house, and for the women of all departments. Here is a club that acknowledges that all men and women who work in a factory have equal privileges. Here is a club not dominated by a few officers of the organization, not dominated by a few superintendents, but a club managed by the elective votes of the members. Here is democracy brought into the industrial world.

No initiation and annual dues of $1 cannot be considered burdensome on the working woman or the working man. For this he or she gets a lunch cheaper than they can buy it elsewhere. They have all of the privileges of a $60,000 concrete and brick clubhouse located across the road from the factory and which clubhouse is as modern and well equipped as could be expected. They have all of the privileges that go with it, all the entertainments, all of the educational courses, all of the privileges of bowling alleys, of pool tables, of the music room, of the tennis courts, of the reading rooms, of the monthly dances or other entertainments. In fact, this working club sets out first of all with the basic principle that the working person is worthy of recognition and that whatever is done for him or her along this line of endeavor is going to be bread cast upon the waters so far as the factory, the community, the state and the nation are concerned.

There were widespread misgivings among many outsiders when this working club was first conceived. Such a club would work all right with factory officers, with factory superintendents, with factory overseers, but not with the working woman and the working man. The story of the working of the club up to the present entirely refutes such arguments. The club is proving a success beyond the fondest expectations. Its success is greatest with the working man. His departments are taking it up more and more.

A few hours spent at different parts of the day and evening up to closing hour at 11 o'clock offer boundless reasons why such a club is a success and why a factory is better off with such an organization. Here is a place of the highest environments, a place of inspiration to every working person, a place where the better part of human existence is developed, where that finer side of the working person gets a favorable opportunity to grow.

It is not a different organization from any city club you could enter. The bowling alleys are as quiet and orderly as in a city club, often more so because of the presence of women either in the games or as spectators. So it is all through the club, which is a veritable hotbed of good, a place where the delicate seeds of good endeavor, so often crushed out, have a chance to germinate; a place where the working man and the working woman have a chance to feel their real stature as human beings.

Such a club will prove a valuable factory asset, an asset whose influence will permeate through every part of the work; an asset that will make the work of the general manager easier; an asset that will make the work of every factory superintendent easier; an asset that will make the work of every department head easier, and an asset that will make the daily hours of every laborer brighter and more hopeful.

Motor Efficiency by Exhaust Analysis

THIS week THE AUTOMOBILE begins a series of articles on the value of exhaust gas analysis as a means of determining motor and car efficiency. The articles are based on a series of experiments conducted exclusively for THE AUTOMOBILE by Herbert Chase of the the Automobile Club of America testing laboratory and Professor Marshall, for years connected with Yale University. The conclusions arrived at in these articles are all based on actual conditions. Different makes of cars and trucks put through the same series of practical tests, being driven over various conditions of roads, where they met with average hill-climbing work, average traffic congestion, average starting and stopping and average conditions that nearly every car owner meets. The series will be continued weekly until completed.

Objections To Holding Engineering Societies' Meetings at Expositions

Prof. F. R. Hutton States Disadvantages—Never Self-Supporting—No Benefits Derived—Accommodations Poor

NEW YORK CITY, Feb. 9—It has almost grown into a custom in the United States, under the leadership of certain enthusiastic souls, to hold Congresses at the time and place of the International Expositions. The alleged philosophy of such gatherings is that the Exposition will attract to the city of its location a number of representative men in their various lines; that being so present, they can be assembled in meetings for the reading and discussion of papers, which shall later be published in a volume and be distributed, for the glory and distinction of the science or the profession in which they have originated. The expenses of such congresses are supposed to be met by a system of "memberships" or "adherences" to the congresses, who pay a subscription sum, and in return receive a copy of the volume if there is enough raised to pay for the edition called for. Memberships must also usually (but not always) be counted on to pay for incidental expenses, such as advertising, clerical hire before the congress, and sometimes in the worst cases, even for the place of meeting.

These expenses begin as soon as the holding of such a congress has been sanctioned by the Exposition authorities. The work of organizing them is considerable, involving the getting of papers, their printing in advance (if the standard is as advanced as this), their distribution, the summoning of qualified debaters, and in general all the routine so familiar to the secretaries of bodies of specialists as in the engineering societies. There are usually transportation and accommodation problems to be coped with by some one for each congress period, during the Exposition.

Self-Supporting Congress Unheard of

A self-supporting congress is an unknown experience. Before the congress opens and memberships are paid in, the advance work has to be paid for in cash, and brains and ability must be secured on the basis of interest in the idea of the congress, or a demand of "noblesse oblige" with respect to it. A sort of guarantee fund must be forthcoming from somewhere, in case of ultimate deficiency, and rarely or never will or can the Exposition authorities furnish the advances or the guarantees.

It must be further obvious that in addition to the higher compulsion of lofty motive, the congresses will have behind them the desire of Exposition promoters that representative men and organizations shall come to their city for the sake of example, for the money which members and others will spend there, and to boom the enterprise generally. To this end, they will make promises which are found later not to be redeemable.

To whom shall the Exposition committee turn for a sense of "noblesse oblige," and for the advance work of organizing, and for the backing of a guarantee? In the case of the professions of Engineering and Medicine, they find societies already organized for the holding of professional meetings, with experience in the conduct of such gatherings, an office staff under a trained secretary, and on the part of the inexperienced, an ambition to win possible glory from an alleged international character attaching to service. Hence the appeal to operate and guarantee is made; and it is one which it takes a deal of courage to resist and decline. It may be that a particular society so requested to take a share of the burden cannot decline, but must accept the duty and its attendant difficulties. Among the disadvantages may be named:

1. The diversion to the work of the congress of society dues, to meet the advances and guarantee. The A. S. M. E. for example has had to obligate itself for $5,000, and the A. I. E. E. for $3,000 for the congress of 1915 at San Francisco.

2. This expenditure does not benefit the society directly, and its indirect benefit is remote if any at all. It benefits the Exposition most of all.

3. So far as the society is concerned, the Congress is as much labor as the society would expend for one of its own meetings, or more, and the society does reap the benefit from the labor of its officers.

4. If the society attempts to recoup itself for its outlay and labor by the expedient of making the sessions of a congress the meetings of a regular convention of the society, it makes two blunders. It places the meeting at a crowded and congested center, where the members find no comfortable accommodation; and the meeting is broken to pieces as a social affair, and the distractions of the place are unfriendly to the professional aspects of both papers and discussions. A meeting of the society and its cost have been wasted, but the society dues have paid for it.

The Society of Automobile Engineers may be congratulated that by the kindly steering action of some of its good friends, it has not been attached to the rolling chariot wheels of the Exposition of 1915, and the obligations of such connection. Its members on the other hand have been asked and urged to give professional papers and other offerings of topical discussion without financial strings tied to them, so that the engineering significance of the motor-vehicle may be clearly obvious. Those who have been thus approached may properly feel the sort of "noblesse oblige" which their selection has imposed upon them.

Denver Club Has Protective System

DENVER, COL., Feb. 5—A highly efficient system of protecting its members against automobile thieves has been worked out by the Denver Motor Club. Every member, upon paying his annual dues, is furnished a protective license plate for his car, announcing the intention of the club to "pursue and punish, regardless of expense," any person molesting the car in any way. In addition to the number of the license plate, the club keeps a complete record of the make of the car, the manufacturer's number, engine number, horsepower, number of cylinders, number of passengers designed for, year made, color of body and running gears, state license number and any special equipment or other marks of identification. This data is kept in card index files, together with the owner's address, telephone number and other essential information. The club maintains its own special officer, who is an expert at identifying and recovering stolen cars. It also guarantees to pay a hundred dollars, if necessary, toward the recovery of a member's stolen car and the capture and prosecution of the thief. While there have been many thefts of cars in this territory the last year, the percentage of recovery has been remarkably high; and the system of identification record introduced this year is counted upon to reduce still further the losses from theft. It is also reported that far more cars have been stolen in other parts of the country, especially in some of the Pacific coast cities. This protective feature is regarded by many of the Denver Motor Club's 1,300 members as the chief benefit of membership.

Motorists Arrested for Late Registration

PHILADELPHIA, PA., Feb. 5.—Refuting the accusation made by motorists that the state highway department had acted hastily in causing the arrest of motorists for operating their cars under 1913 licenses it is declared that the statement that the department was unable to supply these tags was an erroneous one.

Although the law specifies that after January 1 all automobiles operated must bear 1914 tags, it is a physical impossibility to fulfill all the applications, the majority of which are made late in December, by January 1 and therefore it has been customary to allow a few days of grace. It develops that the motorists have taken advantage of this by delaying the making of their applications until sometime in January. This year by working day and night the state was able to catch up with all applications then on file by January 15 and after that all tags were sent out on the day the applications were received.

The state had no right to extend immunity to those motorists that sent in their applications later than this date and so a great many were arrested. The records show that in every arrest the motorist made his application later than this date.

$10,000,000 Lincoln Fund for This Year

Much Lincoln Highway Work Done—Many States Active—2,000 Miles of Road Marked

DETROIT, MICH., Feb. 9.—All signs point to the Lincoln Highway Association completing its $10,000,000 fund this year. Henry B. Joy, president of the association; Roy D. Chapin, vice-president, and the other officials are all enthusiastic over the results achieved thus far and the broad spirit of liberality and patriotism that has been shown by the workers and contributors for this cause. Good roads sentiment is advancing so rapidly that it will be only a few years before there will be permanent hard roads leading to every section and through every state of this country. In this work the Lincoln Highway is declared to be the most prominent movement of the day, and when completed this road will be a model of construction for other highways.

Much of the Lincoln Highway work will be done this year. In the twelve states traversed several million dollars will be spent by the states, counties, cities and villages in straightening and regrading the route selected. In each state, particularly those in the west, "seedling" or demonstration miles are also to be laid.

To place these particular miles, which will average $5,000 each in expense, contributions of $5,000 and more are being received. These sections are thus to be named after the donors, suitable stones or monuments being erected along the highway. Several miles have already been contributed. In states that are wealthy and where the entire work will be done by funds collected in the state it has been proposed to have certain miles named after generous residents of the locality. Citizens of Canton, Ohio, have also come forward with the plan to raise $5,000 in $5 subscriptions in Canton for some mile of road to be placed in a western state and to be known for all times as the Canton mile. Other communities may also take up this plan.

The work of marking the route is also proceeding rapidly. Over 2,000 miles of the way now carries the red, white and blue copyrighted marker. Before July 1 the road will be marked completely, and no tourist need lose the way day or night.

Speedway Co. Gets Timing Device

INDIANAPOLIS, IND., Feb. 10—*Special Telegram*—The Indianapolis Motor Speedway Co. today announced the purchase of the Warner Timing Device which has timed all races held at the speedway. This gives the speedway management control of one of the two timing devices of the kind in the world. While the consideration is not named, it amounted to several thousand dollars.

CHICAGO, ILL., Feb. 9—Ralph DePalma, passing through Chicago on his way to the Santa Monica road races, announced that he will drive in the French Grand Prix for the Mercedes company and that while he is in Europe he also will take part in the Belgian grand prix, also as a direct representative of the Mercedes company. He will drive E. J. Schroeder's Mercedes in the coast events, but at Indianapolis he will have a new Mercedes which he will enter under his own name. DePalma also stated that he is a certain competitor in the Elgin road races.

Montamara Festo Races Announced

TACOMA, WASH., Feb. 3.—Details concerning the Montamara Festo races which will be held on July 4 have recently been announced. There will be three races and prizes aggregating $10,500 will be awarded.

There will be a free-for-all race for the Montmarathon trophy over a distance of 250 miles. The entrance fee is $200 and the total prizes to be distributed add up to $5,500.

The Golden Potlach trophy will be open to non-stock cars of not over 600 cubic inches piston displacement. The distance will be approximately 200 miles and the entrance fee $150. The winner will receive a perpetual challenge trophy and in addition $3,500 cash will be distributed.

The Intercity Century will be confined to cars of not over 450 inches piston displacement, and the cars must be entered from Washington, Oregon, Idaho, Montana, British Columbia or Alberta, where the car must have been driven at least 60 days, and must be operated by a driver who has resided therein at least three months preceding next July 4. The distance will be approximately 100 miles and the entrance fee is $100. The winner will receive a perpetual challenge trophy. Cash prizes of $1,500 will also be disbursed.

The entries close June 28, 1914.

17 Entries for Vanderbilt—19 for Grand Prix

LOS ANGELES, CAL., Feb. 9—*Special Telegram*—Entries to the Vanderbilt and Grand Prix, which are to be run over the Santa Monica course February 21 and 23 respectively, closed today and numbers were allotted. There still remains an opportunity to make additional entries, but the late comers will have to pay increased fees.

Vanderbilt Cup

NO.	CAR	DRIVER	ENTRANT
1	Isotta	Grant	W. Ziegler, Jr.
2	Mercer	Wishart	Mercer Auto. Co.
3	Stutz	Anderson	Stutz Motor Car Co.
4	Mercer	Pullen	Mercer Auto. Co.
5	Delage	Toft	Mrs. L. K. Northam, Inc.
6	Mason	Lewis	Mack Bennett
7	Mercer	Oldfield	Walter M. Brown Co.
8	Stutz	Cooper	Walter M. Brown Co.
9	Fiat	Verbeck	Pacific Coast M. C. Co.
10	Mason	Carlson	McKee's Cafe
11	Apperson	Goode	J. F. Vor Der Mark
12	Mercedes	De Palma	Ralph De Palma
14	Sunbeam	Marquis	W. Ziegler, Jr.
15	Marmon	Ball	Wilbur De Alene
16	Touraine	Joe Rimann	H. A. Conklin
17	Alco	Janette	T. Thorkildsen

American Grand Prix

NO.	CAR	DRIVER	ENTRANT
1	Fiat	Tetzlaff	Savage Tire Co.
2	Mercer	Wishart	Mercer Auto. Co.
3	Stutz	Anderson	Stutz Motor Car Co.
4	Mercer	Pullen	Mercer Automobile Co.
5	Delage	Toft	Mrs. L. K. Northam, Inc.
6	Alco	Taylor	A. H. Woollacott
7	Mercer	Oldfield	George F. Settie
8	Stutz	Cooper	Walter M. Brown Co.
9	Mercer	Not named	Huntley L. Gordon
10	Isotta	Grant	W. Ziegler, Jr.
11	Apperson	Goode	J. F. Vor Der Mark
12	Mercedes	De Palma	Ralph De Palma
14	Sunbeam	Marquis	W. Ziegler, Jr.
15	Marmon	Muth	A. A. Caldwell
16	Fiat	Lewis	Mack Bennett
17	Marmon	Ball	Wilbur De Alene
18	Fiat	Verbeck	Pacific Coast M. C. Co.
19	Alco	Janette	T. Thorkildsen

French Grand Prix Entries Number 23

PARIS, Jan. 31—Sufficient entries have now been received for the French Grand Prix 4 1-2 liter race to assure one of the most keenly disputed events ever seen in Europe. Peugeot, Sunbeam and Delage have each entered a team of three cars. Germany is represented by a team of five Mercedes and three Opels; Italy has a Nazzaro, two Aquila-Italiana and a Caesar car. Alda, a French firm, has put in two cars, making a total at the present time of twenty-three. Among the drivers are Boillot, Goux and Rigal for Peugeot; Chassagne, Lee Guinness and Resta for Sunbeam; Albert Guyot and Bablot for Delage; Lautenschlager and Pilette for Mercedes, and Nazzaro on his own car. There are indications that Fiat will come in at the last moment, and other possible competitors are Nagant, Piccard-Pictet, Benz, and Humber. It is quite probable that the list will close with 35 cars representing the finest European talent.

The race will this year be held in mountainous Auvergne over a portion of the course used for the last Gordon Bennett race in 1905. For the past 5 years this race has been run on a difficult course near Boulogne. The change to Auvergne will provide an even more difficult course putting the small cars to an unusually severe test. The change of course is accompanied by a diminution of the cylinder area. Instead of the 183 cubic inches allowed up to the present, the racers must not exceed 152.5 cubic inches cylinder area, with the restriction that the stroke shall not be more than twice the bore.

Opel Enters Three Cars in French Grand Prix

PARIS, FRANCE, Jan. 24—Opel has entered a team of three cars in the French Grand Prix to be run near Lyons next July. The names of the drivers have not yet been announced. The number of cars officially entered for the French classic is eleven, the firms being Peugeot, Sunbeam, Nazzaro, Alda, and Opel. It is known that Mercedes has five cars ready for the road and will enter them before the end of the month. Alda will put in two more cars and Nazzaro will make an additional entry. It is believed that Fiat will rush in a full team at the last moment. Altogether twenty-five to thirty cars should take part in this race.

A special prize of $1,000 has been offered by the Paris-Lyons-Mediterranee railway company in connection with the grand prix. It has not yet been decided on what basis this prize will be awarded.

Bill in Congress To Protect Makers

Would Prevent Fraud and Unfair Competition on Patented Articles—Provides that Price Be Registered

WASHINGTON, D. C., Feb. 7—Makers of motor car accessories and others are affected by a bill introduced in Congress this week by Representative Langley, of Kentucky, "to prevent fraud and unfair competition in the sale of patented and trade-marked articles."

The bill provides that the owner of every patent and trademark shall as a condition of such patent or trademark be required to file in the patent office a statement showing the prices at which any article covered by the patent or trademark is to be offered for sale. This statement must show the retail price of each such article, together with a list showing all prices and rebates, commissions or discounts of every nature whatsoever at which the said article shall be sold or offered to dealers for the sale of or for the handling of such articles. This list must be registered in the patent office under such rules and regulations as the commissioner of patents may prescribe. A new price list may at any time be substituted for a registered price list, and a fee, not named in the bill, shall be paid in the manner as is now required by law for each price list registered or reregistered.

The bill further provides that all articles covered by the registered price list shall be plainly marked with the retail price at which the same are to be offered for sale and the words "price registered," followed by the date of such registration. The marking may be on the article itself, the label, the container or wrapper.

It is further provided in the bill that it shall be unlawful to sell or offer for sale any article covered by such registered price list at a price different from that named in said list. It will also be unlawful to give or to receive, or to offer or demand, any rebate, commission or discount of any nature whatever for the sale of any article covered by any patent or trademark other than the rebate, discount or commission prescribed in the price list registered in connection with said article.

A penalty of a fine of not less than $100 nor more than $1,000 shall be imposed upon any person convicted for violation of any of the provisions of the proposed law. Any person falsely marking an article as having a registered price or who marks any article with a price other than the one registered shall, upon conviction, be fined not less than $200 nor more than $2,000 for each such offense.

Warnes Law Again Declared Void

COLUMBUS, O., Feb. 10—For the third time in as many months, the Warnes automobile law in Ohio, which was to have become effective January 1, has been declared unconstitutional. The last decision was rendered by the Franklin County Court of Appeals and practically affirms the two decisions of Judge Kinkead in the court of common pleas. It is doubtful if the state administration will carry the case to the Ohio Supreme Court, since all former decisions are against it.

The appeals court went farther than Judge Kinkead and decided that the clause seeking to repeal the former automobile law was inoperative and thus the former law prevails at this time. This is the first court decision on that question. The decision saves two provisions of the Warnes law, that of the flat rate for chauffeurs and also the flat rate for manufacturers and dealers. In the opinion of the court neither rate is excessive and they are declared constitutional.

Since the Ohio General Assembly is still in session some measure may be devised to settle the muddle.

Three Companies Receive Drawbacks

WASHINGTON, D. C., Feb. 7—A number of decisions bearing on questions of interest to the motor car world were given out this week by the secretary of the treasury. One is directed to the collector of customs at New York and directs him to allow, under paragraph O of section 4 of the tariff act of 1913, and the drawback regulations of June 16, 1911, a drawback on motor cars manufactured by the Benz Auto Import Co., New York, with the use of either complete or incomplete imported chassis and domestic motor car bodies manufactured for or on their account from imported French plate glass, leather, hardware, upholstery cloth and similar materials, in combination with domestic materials.

A similar order was directed to the collector at New York to allow drawback on motor car starting and lighting equipments manufactured by the Bijur Motor Lighting Co., Hoboken, N. J., with the use of imported ball bearings and motor generator brushes.

The department also announced the opinion of the court of customs appeals in the case of Michelin Tire Co. vs. United States. In this case leather strips suitable for the manufacture of motor car treads were assessed by the collector of customs at 15 per cent. as leather cut into forms suitable for conversion into manufactured articles. The importers protested that the merchandise was properly dutiable as leather belting. The board of general appraisers overruled the protest of the importers and the court of customs appeals affirmed the board's decision.

Test Colorado's Automobile Law

DENVER, COL., Feb. 5—A case to test Colorado's new state law requiring an annual state license tax upon all motor vehicles was opened yesterday by the Logan County Automobile Assn. in the county court. The law is opposed in that section of the state, on the ground that it gives to the individual counties only a part of the fees collected by the respective counties, the state keeping half the income for a general state road fund. The association brought the issue into court by having one of its members refuse to pay his license for 1914.

Gray & Davis Win in Lamp Suit

CAMBRIDGE, MASS., Feb. 10—*Special Telegram*—Gray & Davis, Inc., have won the suit instituted against them by the Dubois Safety Lamp Co., for infringement of Patent No. 919,837 covering an inside set screw for automobile lamps. The favorable decree was granted by Judge Hunt in the United States District Court, Southern District of New York. It concedes the right of Gray & Davis, Inc., to manufacture and use this device under their own Letters Patent No. 764,396, granted July 5, 1904. The plaintiff will pay the costs.

Indiana Supreme Court Reverses Dealers' Case

INDIANAPOLIS, IND., Feb. 7—The Indiana Supreme Court has held in the action brought by Cecil E. Gibson and Benjamin Meixell against the American Motor Car Sales Co. in which $100,000 damages was sought for breaking a contract for the agency for the Marion motor car, that a foreign corporation which has been admitted to do business in Indiana and has created liabilities in the state cannot withdraw from the state, revoke the authority of the person authorized to receive processes and thus leave claimants against it without remedy in the Indiana courts. The case is reversed to the county courts for a hearing on its merits.

Bill to License by Weight and H. P.

TRENTON, N. J., Feb. 10—A bill introduced in the New Jersey Legislature provides for the licensing of automobiles according to weight as well as horsepower. The measure provides for the payment of a fee of 50 cents a horsepower for automobiles of the first class, 60 cents for the second class, 70 cents for the third class, 80 cents for the fourth class and $1 for the fifth class.

Automobiles of 22 horsepower or less and weighing 2,000 pounds or less shall be of the first class; automobiles of 22 horsepower or less and weighing over 2,000 pounds and less than 3,000 pounds shall be of the second class; automobiles of over 22 horsepower and less than 36 horsepower and weighing 3,000 pounds or less shall be of the third class; automobiles of over 22 horsepower and less than 36 horsepower and weighing over 3,000 pounds shall be of the fourth class; all automobiles of 36 horsepower or over shall be of the fifth class.

Commercial cars shall pay according to the foregoing schedule, excepting those weighing over 4,000 pounds, which shall pay $2 in addition to the regular fee. Should this bill pass, this State will be the first one to use weight as an element in fixing license fees for automobiles.

New Jersey Will Recognize 1913 License Tags

NEW YORK CITY, Feb. 9—The commissioner of motor vehicles for New Jersey, J. B. Lippincott, has notified the police officials throughout that state to recognize the 1913 New York State license tags which many motorists are obliged to use pending the receipt of the new 1914 tags. It is reported that Connecticut and perhaps nearby states, will follow the action of New Jersey in extending this courtesy to New York motorists.

NEW YORK CITY, Feb. 9—The annual meeting of the U. S. Rubber Co. will be held at New Brunswick, N. J., on March 17.

Supply Mfg. Company Appeals Horn Decision

Chandler Elects Officers—Martin Tractor Company Warns Infringers

NEW YORK CITY, Feb. 7—An appeal has been taken by the Automobile Supply Mfg. Co., Brooklyn, N. Y., from the decision of Judge Chatfield, of the U. S. District Court for the Eastern District of New York, handed down recently and which held the Newtone horn, manufactured by the Automobile Supply Co., to be an infringement of the Klaxon patents. The appellants base their appeal on alleged errors and erroneous conclusions, made by the Court.

The appeal was allowed by Judge Chatfield on January 28, after a motion to that effect had been argued. A citation, made returnable on February 28, has been issued, to be before the United States Circuit Court of Appeals for the Second Circuit. The date for argument of the appeal will be fixed on February 28, when the Klaxon and Newtone companies will appear before Judges Lacombe, Cox, Ward and Rogers.

The appellant attorneys expect that the case will be placed on the preferred calendar under the new rules in equity in order that it may be decided as early as possible. It is expected that the whole case will be reargued around April 1.

Nonpareil and Pilot Take Klaxon Licenses

NEW YORK CITY, Feb. 11—The Nonpareil Horn Mfg. Co., the maker of the hand-operated Pilot horn, and Culmer Engineering Company, maker of the Reliance hand-operated horn, of New York City, each of which was sued by the Lovell-McConnell Mfg. Co., on its basic Klaxon patents, Nos. 923,048, 923,049 and 923,122, granted May 25, 1909, have acknowledged the validity of said patents, and have consented to decrees and injunctions against them.

The Lovell-McConnell Mfg. Co. has granted each of them a special limited license to make and market on royalty, each its own present model of horn, but not any other new or different model.

Chandler Holds Meeting and Elects Officers

CLEVELAND, O., Feb. 6—At the first annual meeting of stockholders of the Chandler Motor Car Co., which was held in Cleveland this week, the following officers and directors were re-elected: President F. C. Chandler; vice-pres., C. A. Emise; second vice-pres., W. S. M. Mead; treas. Samuel Regar; secretary, Isador Grossman. Directors: W. R. Hopkins, J. W. Deutsch, H. G. Strong, Albert H. Jarecki, W. P. Herbert, F. C. Chandler, C. A. Emise, W. S. M. Mead, and S. Regar.

Restraining Order in Walker Chain Case

NEW YORK CITY, Feb. 9—A temporary restraining order has been issued to the Weed Chain Co. as against the Walker Tire Chain Co., of Zanesville, O. This order holds good until February 13, when the Court will decide whether it will be vacated or not.

Canada Has 43,479 Motor Vehicles

OTTAWA, ONT., Feb. 7—According to a statement in the report of the Department of Commerce regarding the number of motor cars in use in certain countries, the following is the number of motor cars in Canada, the Ontario and Saskatchewan figures including commercial vehicles: Prince Edward Island 25; Nova Scotia 1,442; New Brunswick 830; Quebec 4,813; Ontario 15,255; Manitoba 4,975; Saskatchewan 4,200; Alberta 3,435; British Columbia 5,304; the total being 43,479.

Martin Tractor Company Warns Infringers

SPRINGFIELD, MASS., Feb. 9.—The Martin Tractor company has recently issued a statement concerning their patents on tractors. It is as follows: "Inasmuch as many manufacturers are engaged in designing motor driven independent tractors for various kinds of heavy hauling, it seems advisable to notify the trade that no one can combine any automobile with a wagon in such a way that the wagon is supported on wheels at the rear and supported in front on the back of the automobile by any rocking connection whatever, without infringing basic patents. These patents are owned by Mr. C. H. Martin.

"The Martin Tractor Company of Springfield, Mass., and the Knox Automobile Company of Springfield are the only licensees under these patents. Both the owner of the patents and the licensees will avail themselves of every protection afforded by law to prevent invasion of their rights."

Among the patents referred to are the following: Hunter, 670,405, Mar. 19, 1901; 696,143, Mar. 25, 1902; 625,953, May 30, 1899; Thayer, 678,063, July 9, 1901; Martin, 1,018,248, Feb. 20, 1912; Hight, 698,836, April 29, 1902, and Liebau, 655,724, Aug. 14, 1900.

Gray & Davis Has Ford Electric System

BOSTON, MASS., Feb. 7—Gray & Davis, Inc., have designed and perfected a starting-lighting system for Ford cars. This new system is simple and compact, and can be installed by any mechanic or garage in a few hours. The system starts and lights the car, and furnishes current for auxiliary purposes. This system can be installed on any used Ford as well as new cars. The system was designed and developed by Alexander Churchward, chief engineer. The Edison battery is used.

Page to Talk to Truck Club Feb. 18

NEW YORK CITY, Feb. 9—Logan Waller Page, director of the Bureau of Good Roads, Department of Agriculture, Washington, D. C., will address the Motor Truck Club, February 18, on the Effect of Motor Truck Use on Highways. The lecture will be illustrated and will be held at the A.C.A. building.

NEW YORK CITY, Feb. 9—The Invader Oil Co. of New York has just completed an agreement with the Beckley-Ralston Co., of Chicago, to handle Invader Oil and I-O-L products. This company will act as middle Western branch and warehouse.

Automobile Securities Quotations

Few changes of any importance occurred in this week's securities quotations. Firestone Tire common rose 14 points. Goodyear common dropped 5 points.

	1913 Bid	1913 Asked	1914 Bid	1914 Asked
Ajax-Grieb Rubber Co., com	165	185	200	..
Ajax-Grieb Rubber Co., pfd	95	100	98	102
Aluminum Castings, pfd	98	100	97	100
Chalmers Motor Company, com	..	..	..	92
Chalmers Motor Company, pfd	..	..	92	94
Firestone Tire & Rubber Co., com	355	362	260	..
Firestone Tire & Rubber Co., pfd	106	108	105	107
Garford Company, preferred	105	107	80	90
General Motors Company, com	34	35	56	57
General Motors Company, pfd	78	79	88	89
B. F. Goodrich Company, com	55	56	23	24
B. F. Goodrich Company, pfd	103	104½	90	91
Goodyear Tire & Rubber Co., com	460	470	215	225
Goodyear Tire & Rubber Co., pfd	104	105	98	100
Gray & Davis Co., preferred	..	..	90	97
Hayes Manufacturing Company	..	90	..	..
International Motor Co., com	5	15	..	5
International Motor Co., pfd	25	40	..	15
Kelly-Springfield Tire Co., com	23	25	49	50½
Kelly-Springfield Tire Co., pfd	70	80	120	125
Kelly-Springfield Motor Truck Co., com	..	..	40	60
Kelly-Springfield Motor Truck Co., pfd	..	..	90	105
Lozier Motor Company, com	..	..	12	..
Lozier Motor Company, pfd	..	..	..	65
Maxwell Motor Company, com	..	..	5¼	5¾
Maxwell Motor Company, 1st pfd	..	..	27½	28
Maxwell Motor Company, 2nd pfd	..	..	9	9½
Miller Rubber Company	195	200	124	130
New Departure Mfg. Co., com	..	..	..	125
New Departure Mfg. Co., pfd	..	..	103	106
Packard Motor Company, pfd	103	105	94	98
Palmer & Singer, pfd	..	..	..	65
Peerless Motor Company, com	..	..	15	25
Peerless Motor Company, pfd	..	..	75	80
Pope Manufacturing Co., com	29	32	1	2
Pope Manufacturing Co., pfd	75	78	8	10
Portage Rubber Co., com	..	..	..	40
Portage Rubber Co., pfd	..	..	..	90
Reo Motor Truck Company	11½	12¼	7½	8½
Reo Motor Car Company	20½	21¼	18	19
Rubber Goods Mfg. Co., pfd	105	108	105	115
Russell Motor Car Co., com	..	..	..	40
Russell Motor Car Co., pfd	..	..	..	90
Splitdorf Electric Co., pfd	..	..	40	50
Stewart-Warner Speedometer Co., com	..	..	55	57
Stewart-Warner Speedometer Co., pfd	..	..	98	100
Studebaker Company, com	34	35	28½	30
Studebaker Company, pfd	92	93	85	87
Swinehart Tire Company	104	105½	69	71
U. S. Rubber Co., com	67	67½	59	59½
U. S. Rubber Co., 1st preferred	107	107½	101½	102
Vacuum Oil Co	..	..	210	213
White Company, preferred	105	108	105	110
Willys-Overland Co., com	70	71	66	68
Willys-Overland Co., pfd	98¼	99½	91	95

1913 Motor Exports Are $27,029,451

25,880 Passenger Cars and 1,009 Trucks—Year's Gain $3,325,462

WASHINGTON, D. C., Feb. 10—*Special Telegram*—The Bureau of Statistics today announced motor car exports during calendar year 1913 were 25,880 passenger cars, valued at $25,342,644 and 1,009 commercial cars, valued at $1,686,807. Combined exports of passenger and commercial cars in the calendar year 1912 were 23,720 cars, valued at $23,703,989 and in 1911, 15,807 cars valued at $15,924,361.

December exports were 2,301 passenger cars, valued at $2,051,484 and commercial cars valued at $100,660, as against 1,926 passenger cars valued at $1,895,462 and eighty-seven commercial cars, valued at $165,350 exported in December, 1912.

Exports of parts, not including engines and tires, increased in value from $367,364 in December, 1912 to $540,042 in December last and from $4,604,129 to $6,270,116 during the calendar year. Canada was the biggest purchaser of last year, buying 6,051 cars, valued at $8,177,256.

$700,000 Tire Firm for Pacific Coast

SEATTLE, WASH., Feb. 7—The Pacific Tire & Supply Co. has been incorporated in the state of Washington to manufacture automobile pleasure car and truck tires and rubber belting. The company is capitalized at $700,000, of which $200,000 is in cash. B. L. Gates, a wealthy business man who is financing several motor car concerns in Seattle, is at the head of the new corporation. He left yesterday for the East to conclude negotiations for machinery and to confer with several expert tire builders who are now connected with Akron factories who will be brought to Seattle to take charge of the factory here.

The plant will have a daily capacity of 150 tires, but at the outset only fifty tires will be turned out each day.

Packard Does Big January Business

DETROIT, MICH., Feb. 7—Total sales of Packard motor carriages during the last month exceeded the record of any January since the Packard Motor Car Co. started in business. Sales were distributed about equally between 38 and 48 six-cylinder cars. The increase in truck business has made necessary a substantial increase in the truck shop forces. One of the largest truck sales closed during the month was that of twenty-four vehicles, of 2 and 3-ton capacity, to the Loose-Wiles Biscuit Co. of New York. The sale amounted to about $75,000.

Skies Clearing for Pope Mfg. Co.

HARTFORD, CONN., Feb. 9—The skies appear to be clearing for the Pope Mfg. Co. in this city under the receivership with Colonel George Pope at the helm. From Boston there has come to this city a rumor of a reorganization of the company, which of course, is the logical mode of procedure. Colonel George Pope, the sole receiver in the state of Connecticut says in reply to the rumor that plans for a reorganization have been talked over. Nothing definite has been done and the business at present is being run in accordance with a conservative policy which is certain to afford good results. The fact that the Connecticut courts are well satisfied with the showing made under the receivership is indicative. It is without doubt the desire of all actively identified with the Pope Company to see an early reorganization and a restoration of an era of confidence. Colonel George Pope knows nothing more than that the matter is being discussed. The new four cylinder models are now coming through the factory and shipments will be made early next week.

Fisk Tire Co.'s Annual Report

NEW YORK CITY, Feb. 6—The Fisk Rubber Co., which was recently financed through Boston and New York banking interests, has issued its first annual report for the year ended October 31, 1913. The company was incorporated under Massachusetts laws October 23, 1912, and acquired the business and property of the Fisk Rubber Co. of Delaware. In connection with this transaction $2,425,837 in new cash was provided.

The profits for the year ending October 31, after deducting all expenses, including depreciation and interest, were $606,000. Special charge-off of $117,688 was made to reduce the inventory of crude rubber. The dividends on the first and second preferred totalled $285,833, leaving a balance of $202,479.

The net profits were less than were anticipated, due principally to a 20 per cent. less gross than was planned for, accounted for by inability to complete plant additions in time to secure the benefit of the anticipated increased capacity, and to lower selling prices induced by the decline in crude rubber.

During its late year the company expended $982,745 for plant additions, which have now been fully completed. The amount charged to repairs was $106,918, besides $71,431 for depreciation.

On October 31, the company had net quick assets of $3,216,037.

For 3 successive years production of the company has not been sufficient to meet the sales requirements, notwithstanding that the plant has been operated on a night-and-day basis. This difficulty has been overcome by the enlarged plant. The sales organization has been broadened, and plans for 1914 are expected to result in a material increase in net earnings.

Stewart-Warner Shows Surplus of $638,027

NEW YORK CITY, Feb. 9—The balance sheet of the Stewart-Warner Speedometer Corp., Chicago, Ill., as of December 31, 1913, compares as follows:

Assets	1913	1912
Real estate, buildings, machinery	$977,794	$926,492
Patents, trade-marks, good-will, etc.	9,092,165	9,152,983
Materials and supplies	972,783	706,848
Notes and accounts receivable	640,142	559,457
Cash	127,484	59,390
Deferred charges	15,685	9,687
Totals	$11,826,653	$11,414,857
Liabilities		
Preferred stock	$929,800	$1,000,000
Common stock	10,000,000	10,000,000
Notes and accounts payable	253,466	400,022
Reserves	5,360	14,835
Profit and loss surplus	638,027	.....
Total	$11,826,633	$11,414,857

N. Y. Mitchell Agency Goes to Drouet & Page

NEW YORK CITY, Feb. 10—Drouet & Page will, after February 15, become agents for the Mitchell car in this city. They will handle the retail end of the Mitchell business in this city while the Mitchell factory will retain its wholesale branch. The wholesale territory comprises fourteen States, and under the supervision of C. P. Skinner, does a business of $1,000,000 a year. Mr. Skinner and his staff will move from the store at Broadway and 62d street to the Mitchell's own building at 419 West 55th street.

The new Marmon branch, of which F. G. Carris is manager will move into the store vacated by the Mitchell people.

Market Changes of the Week

This week's markets saw the usual changes. Most of them were in the metal markets. Tin rose $0.85 per 100 pounds, while both Bessemer and Open-hearth steels again saw a rise of $1.00 per ton, closing at $21.00 at a gain of $2 for the last 2 weeks. Both Electrolytic and Lake coppers experienced gains this week, the former $0.00 3-20 per pound, and the latter $0.00 1-8. Cottonseed oil dropped $0.07 per barrel.

Material	Wed.	Thurs.	Fri.	Sat.	Mon.	Week's Changes
Antimony	.06	.06	.06	.06	.06	.....
Beams and Channels, 100 lbs.	1.36	1.36	1.36	1.36	1.36	.....
Bessemer Steel, ton	20.00	21.00	21.00	21.00	21.00	+1.00
Copper, Elec., lb.	.14 9/20	.14 13/20	.14⅜	.14⅜	.14⅜	+ .00 3/20
Copper, Lake, lb.	.14⅝	.14⅞	.14¾	.14¾	.14¾	+ .00⅛
Cottonseed Oil, bbl.	7.07	7.05	7.06	7.10	7.00	— .07
Cyanide Potash, lb.	.17	.17	.17	.17	.17	.....
Fish Oil, Menhaden, Brown	.40	.40	.40	.40	.40	.....
Gasoline, Auto., bbl.	.16	.16	.16	.16	.16	.....
Lard Oil, prime	.93	.93	.93	.93	.93	.....
Lead, 100 lbs.	4.15	4.15	4.15	4.15	4.15	.....
Linseed Oil	.52	.52	.52	.52	.52	.....
Open-Hearth Steel, ton	20.00	21.00	21.00	21.00	21.00	+1.00
Petroleum, Kans. crude, bbl.	1.05	1.05	1.05	1.05	1.05	.....
Petroleum, Pa., crude, bbl.	2.50	2.50	2.50	2.50	2.50	.....
Rapeseed Oil, refined	.59	.59	.59	.59	.59	.....
Rubber, Fine Up-River, Para	.77	.75	.75	.76	.76	— .01
Silk, raw Italy	....	5.15	....	....	5.15	.....
Silk, raw Japan	....	4.28	....	....	4.25	— .03
Sulphuric Acid, 60 Baume	.90	.90	.90	.90	.90	.....
Tin, 100 lb.	39.40	41.00	39.75	40.00	40.25	+ .85
Tire Scrap	.04½	.04½	.04½	.04½	.04½	.....

Interstate Plant Sold for $215,000

Receiver Rejects Sealed Bids on Auction Guarantee of $175,000

INDIANAPOLIS, IND., Feb. 9—Interests represented by F. C. Ball of Ball Bros., glass makers at Muncie, have bought the plant of the Interstate Automobile Co. in that city for $215,000. The sale was made by Harry C. Sheridan, referee in bankruptcy, at an auction sale conducted February 5.

Mr. Ball says that the people he represents will immediately complete the unfinished cars in the plant. He has made no statement as to the future plans, beyond this. It is generally understood, however, that a low-priced car will be built. Mr. Ball says his motive in buying the plant was to save it for Muncie as he understood others who bid had expected to dismantle it and move to some other city.

The referee rejected the sealed bids submitted, after Samuel L. Wildermuth, of Chicago, had insisted an auction should be conducted, promising he would guarantee a bid of $175,000. The sealed bids were $150,000 from Mr. Ball and $155,000 from Charles A. Finnegan, with whom was associated Thomas F. Hart, who was president, principal owner and general manager of the Interstate company.

Mr. Finnegan recently bought the property at Buffalo of the E. R. Thomas Motor Co. The liabilities of the Interstate company were about $500,000 and in the final settlement it is thought creditors will receive about 40 cents on the dollar.

International Cyclecar Company Organized

NEW YORK CITY, Feb. 9.—Fred K. Parke, former vice-president of the E-M-F Motor Car Co. and of the Studebaker Corp., and of late vice-president and general manager of the Universal Motor Truck Co., has entered the field of the cyclecar manufacturers and has joined Charles A. Trask designer of the Economy cyclecar, in the formation of the International Cyclecar Co. Temporary offices have been opened at 1790 Broadway, where the working force is being organized, prior to starting active work at the factory at Providence, R. I. This factory has 100,000 square feet of floor space.

Trask to Build Cyclecars in Providence

NEW YORK CITY, Feb. 7—C. A. Trask, designer of the Economy cyclecar, has been joined by F. K. Parke, who, until recently, was vice-president and general manager of the Universal Motor Truck Co., in a project to build cyclecars, of that design, in Providence, R. I. The company's name will be the International Cyclecar Co., with offices in New York City.

Mr. Trask has been connected with the Cartercar Co., in the capacity of production manager and later was identified with the Henderson M. C. Co., and Nordyke & Marmon, in Indianapolis.

The International Cyclecar Co. opened offices in the United States Rubber Bldg., 1790 Broadway.

Cameron Brings Out Euclid Cyclecar

NEW YORK CITY, Feb. 9.—E. S. Cameron, designer of the Cameron car for fourteen years, has entered the cyclecar field with the Euclid, which is to be manufactured by the Euclid Motor Car Co., temporary offices of which have been opened at 80 Broad Street.

The new car will have a four-cylinder C. S. C. motor, 96-inch wheelbase, 40-inch tread, and will sell for $395. Other features will include left steer, with center control; side-by-side seats; two brakes on rear wheels, and gearset a unit with the motor.

Saginaw Cyclecar Has Side-by-Side Seating

SAGINAW, MICH., Feb. 5.—The Valley Boat & Engine Co., Saginaw, Mich., has entered the cyclecar field with the Saginaw, a side-by-side seater weighing 650 pounds and selling for $395. It has a wheel base of 100.5 inches. A speed of 50 miles per hour and a gasoline consumption of one gallon every 50 miles are claimed for it.

The car will be equipped with a two-cylinder, air-cooled motor, located in front. The bore and stroke is 3⅜ by 3 29/32 inches. An Atwater Kent ignition outfit is used and lubrication is by combination splash and force-feed.

A friction drive transmits the power from the motor to a jack shaft, from whence V-belts take it to the wheels. Tubular axles are fitted and the wheels are of the wire type, 29 by 2¾. One-quarter elliptic springs are employed.

The equipment includes a top with rubber curtains, a one-piece windshield, electric horn and lights operated by a storage battery, a Stewart 60-mile speedometer, full kit of tools and non-skid tires.

The company has started on a lot of 1,000 cars and expects to begin deliveries the last of this month.

Hatfield to Make Cyclecars

ELMIRA, N. Y., Feb. 9—Charles Hatfield, Jr., former president of the Hatfield Motor Truck Co., has closed a contract with Ives Motor Co., of Owego, N. Y., for 1,000 motors to be used in a new cyclecar to be manufactured by the Hatfield interests.

Piston Displacement Table for Sixes

DETROIT, MICH.—Editor THE AUTOMOBILE.—The accompanying table showing piston displacement in cubic inches for six-cylinder motors may be of value at present because of the very general use of sixes. It supplements a similar chart on four-cylinder motors which I compiled several years ago.—FRANK H. TREGO, Research Engineer, Packard Motor Car Co.

S. A. E. European Trip Starts About Oct. 10

NEW YORK CITY, Feb. 9—A sailing date from New York of about October 10 has been set for the second European trip of the S.A.E. The first stop will be Paris, where a stay of 4 days is scheduled. During this stay the following plants will undoubtedly be available for inspection: Panhard, Renault, DeDion, Clement, Peugeot, Delaunay-Bellville, Lemoine, etc. By night train the party will proceed from Paris to Turin, Italy. Between Turin and Milan 3 days are to be spent, visiting the Fiat, Isotta, Itala, Lancia, Zust and Bianchi factories. Lucerne, Switzerland, on the lake of the same name, is the next stop, with 36 hours

PISTON DISPLACEMENTS OF SIX-CY

Bore, Inches	STROKE IN INCHES												
	4	4⅛	4¼	4⅜	4½	4⅝	4¾	4⅞	5	5⅛	5¼	5⅜	5½
2⅛	117.8	121.5	125.2	128.9	132.5	136.2	139.9	143.6	147.2	150.9	154.6	158.3	162.0
2⅛	123.8	127.6	131.5	135.4	139.2	143.1	147.0	150.8	154.7	158.6	162.5	166.3	170.2
2¼	129.9	133.9	138.0	142.1	146.1	150.2	154.2	158.3	162.4	166.4	170.5	174.5	178.6
2⅜	136.1	140.4	144.7	148.9	153.2	157.4	161.7	165.9	170.2	174.4	178.7	182.9	187.2
2⅜	142.6	147.0	151.5	155.9	160.4	164.8	169.3	173.7	178.2	182.6	187.1	191.6	196.0
2⅛	149.1	153.8	158.4	163.1	167.7	172.4	177.0	181.7	186.4	191.0	195.7	200.4	205.0
2¼	155.8	160.7	165.5	170.4	175.3	180.1	185.0	189.9	194.8	199.6	204.5	209.4	214.2
2⅝	162.7	167.7	172.8	177.9	183.0	188.1	193.1	198.2	203.3	208.4	213.5	218.6	223.6
3	169.6	174.9	180.2	185.5	190.8	196.1	201.4	206.7	212.0	217.3	222.6	227.9	233.2
3⅛	176.8	182.3	187.8	193.4	198.9	204.4	209.9	215.4	221.0	226.5	232.0	237.5	243.1
3⅛	184.1	189.8	195.6	201.3	207.1	212.8	218.6	224.4	230.1	235.9	241.6	247.4	253.1
3⅜	191.5	197.5	203.5	209.5	215.4	221.4	227.4	233.4	239.4	245.4	251.4	257.3	263.3
3⅛	199.1	205.3	211.5	217.8	224 0	230.2	236.4	242 6	248.9	255.1	261.3	267.5	273.7
3⅜	206.8	213.3	219.8	226.2	232.7	239.1	245.6	252.1	258.5	265.0	271.5	277.9	284.4
3⅞	214.7	221.4	228.1	234.8	241.6	248.3	255.0	261.7	268.4	275.1	281.8	288.5	295.3
3⅞	222.7	229.7	236.7	243.6	250.6	257.5	264.5	271.5	278.4	285.4	292.3	299.3	306.3
3⅞	230.9	238.1	245.3	252.6	259.8	267.0	274.2	281.4	288.6	295.9	303.1	310.3	317.5
3⅛	239.2	246.7	254.2	261.7	269.1	276.6	284.1	291.6	299.0	306.6	314.0	321.5	329.0
3⅛	247.4	255.2	262.9	270.6	278.4	286.1	293.8	301.6	309.3	317.0	234.8	332.5	340.3
3⅛	256.3	264.3	272.3	280.3	288.4	296.4	304.4	312.4	320.4	328.4	336.4	344.4	352.5
3⅜	265.1	273.4	281.7	290.0	298.2	306.5	314.8	323.1	331.4	339.7	347.9	356.2	364.5
3⅛	274.0	282.5	291.1	299.7	308.2	316.8	325.4	333.9	342.5	351.0	359.6	368.2	376.8
3⅞	283.0	291.8	300.7	309.5	318.4	327.2	336.1	345.0	353.8	362.6	371.4	380.3	389.1
3⅛	292.2	301.3	310.5	319.6	328.7	337.9	347.0	356.1	365.3	374.4	383.5	392.7	401.8
4	301.6	311.0	320.4	329.9	339.3	348.7	358.1	367.6	377.0	386.4	395.8	405.3	414.7
4⅛	311.1	320.8	330.5	340.3	350.0	359.8	369.4	379.1	388.9	398.6	408.3	418.0	427.8
4⅛	320.7	330.8	340.8	350.8	360.8	370.9	380.9	390.9	400.9	410.9	421.0	431.0	441.0
4⅛	330.5	340.9	351.2	361.5	371.8	382.2	392.5	402.8	413.2	423.5	433.8	444.1	454.5
4⅜	340.5	351.1	361.8	372.4	383.0	393.7	404.3	415.0	425.6	436.2	446.9	457.5	468.2
4⅛	350.6	361.5	372.5	383.4	394.4	405.3	416.3	427.2	438.2	449.1	460.1	471.1	482.0
4⅛	360.8	372.1	383.3	394.6	405.9	417.2	428.4	439.7	451.0	462.3	473.5	484.8	496.1
4⅞	371.2	382.8	394.4	406.0	417.6	429.2	440.8	452.4	464.0	475.6	487.2	498.8	510.4
4⅛	381.7	393.6	405.6	417.5	429.4	441.3	453.3	465.2	477.1	489.1	501.0	512.9	524.9
4⅛	392.4	404.6	416.9	429.2	441.4	453.7	466.0	478.2	490.5	502.7	515.0	527.3	539.5
4⅛	403.2	415.8	428.4	441.0	453.6	466.2	478.8	491.4	504.0	516.6	529.2	541.8	554.4
4⅛	414.2	427.1	440.1	453.0	466.0	478.9	491.8	504.8	517.7	530.7	543.6	556.6	569.5
4⅛	425.3	438.6	451.9	465.2	478.5	491.7	505.0	518.3	531.6	544.9	558.2	571.5	584.8
4⅛	436.6	450.2	463.8	477.5	491.1	504.8	518.4	532.1	545.7	559.3	573.0	586.6	600.3
4⅛	448.0	462.0	476.0	490.0	504.0	518.0	532.0	546.0	560.0	574.0	588.0	602.0	616.0
4⅛	459.5	473.9	488.3	502.6	517.0	531.3	545.7	560.1	574.4	588.8	603.1	617.5	631.9
5	471.2	486.0	500.7	515.4	530.1	544.9	559.6	574.3	589.0	603.8	618.5	633.2	648.0
5⅛	483.1	498.2	513.3	528.4	543.5	558.6	573.7	588.8	603.9	619.0	634.1	649.2	664.3
5⅛	495.1	510.6	526.0	541.5	557.0	572.5	587.9	603.4	618.9	634.3	649.8	665.3	680.8
5⅜	507.2	523.1	538.9	554.8	570.6	586.5	602.4	618.2	634.1	649.9	665.8	681.6	697.5
5⅛	519.5	535.8	552.0	568.3	584.5	600.7	617.0	633.2	649.4	665.7	681.9	698.1	714.4
5⅞	532.0	548.6	565.2	581.9	598.5	615.1	631.7	648.4	665.0	681.6	698.2	714.9	731.5
5⅛	544.6	561.6	578.6	595.6	612.7	629.7	646.7	663.7	680.7	697.7	714.8	731.8	748.8
5⅞	557.3	574.7	592.1	609.6	627.0	644.4	661.8	679.2	696.6	714.1	731.5	748.9	766.3
5⅛	570.2	588.0	605.8	623.7	641.5	659.3	677.1	694.9	712.8	730.6	748.4	766.2	784.0

given to sight-seeing trips on the lake and up the Rigi. From Lucerne to Schaffhausen at the Falls of the Rhine, is a short trip, and here is located one of the best examples of electric steel foundries in Europe. Stuttgart, with the Mercedes-Daimler, Bosch and Eisemann plants, is the next point of interest, where a stop of 2 days is scheduled. The Krupp works will most likely be visited, including a trip down the Rhine. After this the Metallurgique and Minerva plants will be visited. A scheduled stop at London of 5 days' duration is next. The return voyage is from Liverpool, arriving in New York on or about November 18. The whole trip is of 39 days' duration, that is from New York to New York. It has been estimated that the cost of the entire trip will be about $550.

New Columbus Buggy Co. Having a Hard Time

COLUMBUS, O., Feb. 9—Because of the inability of the New Columbus Buggy Co., of Columbus, O., to finance the new undertaking, four of the directors of the new company resigned late last week. They were Robert H. Jeffrey, O. A. Miller, F. O. Schoedinger and T. J. Cavanaugh. This action caused a stir in financial circles and for a time there was talk of a receiver for the new concern. This was averted, however, and D. N. Postlewaite, B. G. Watson and T. C. Dunlap were elected directors to fill three of the vacancies.

All of the men employed at the plant in Dublin avenue were paid off February 5 and told they would not be needed for the time being. Saturday morning about fifty of the men were again placed on the force to complete work for which orders have been received and on which deliveries have been promised soon.

In the meantime another effort will be made to secure sufficient financial backing to operate the plant.

NEW YORK CITY, Feb. 9—The Marmon New York Co. will in the future handle the Marmon car in this city. This car has been handled for years by Sidney B. Bowman. F. G. Carrie will be manager of the new company while Howard Wagner will continue to represent the Nordyke & Marmon Co., Indianapolis, Ind., in the East, traveling the territory.

Packard Co. Readjusts Selling Season

New Models To Appear in the Autumn —Will Equalize Production

DETROIT, MICH., Feb. 7—In a statement issued to the Packard dealers and branches, President Henry B. Joy of the Packard Motor Car Co., today makes it known that the split schedule whereby one model of chassis is given to the public in the fall and another in the spring has been abandoned and that hereafter deliveries of both models will begin in the fall. It has been the custom of the Packard company to announce one of its new cars in April and the other about September 1, but the readjustment of the selling season calls for deliveries of model 38 to begin September 1, and deliveries of model 48 cars not to be scheduled before October 1.

This readjustment is the result of an effort to better meet the demands of the peak-load months, so called. In his statement, Mr. Joy says that April was peak-load month last spring, with May, March and June close up in the order named. The aim is to operate the manufacturing departments at a constant rate during the winter months when the delivery requirements are one-third to one-half of the spring demand so as to accumulate bodies in the rough and machine stock for chassis. These then can be used to meet as far as practicable the greater demands of the months of March, April, May and June. From this point of view, the change is obviously better for the manufacturing department than having one model of chassis coming through at a time.

In his statement, Mr. Joy further brings out that inasmuch as statistics show that July and August are low months, the cessation of deliveries in these months is fraught with the least inconvenience to Packard buyers. Consequently deliveries will not be booked for later than June 30 nor earlier than Sept. 1. Packard dealers are therefore instructed not to accept specifications for shipments during July and August.

There is also another heavy draft for cars in the fall and early winter, which condition is met by similar accumulative operations in the factory during the summer months of June, July and August when the concern's customers are chiefly at the seashore, in the mountains or abroad and not buying cars. It is also pointed out that the Packard company is obliged to lose some production in July and August in order to provide for the rearrangement of shop machinery, rerouting of stock through the factory and other changes looking to the beginning of a new season.

Chassis Have Been Standardized

Mr. Joy states further, "Our chassis have become standardized, and our present design promises to remain substantially unchanged for several years. Shop conditions have been simplified and we are in a position to outline with much greater assurance than ever before our future program in accordance with statistical demands of the public.

"The readjustment of the selling season works to the advantage of those who want fall delivery of closed cars according to the announcement. It is a matter of educating the buyer to choose his winter car in the spring so as to get his car in the fall when he wants it.

"We have been severely criticised, by prospective buyers returning from summer vacations and seeking prompt deliveries of certain types, all of which have been engaged in advance by far-seeing purchasers. This situation occurs every year. It is not pleasant to advise a valued patron that it will require from 100 to 110 days to complete his order. Even when we have a desired type of body, from 4 to 6 weeks will be required to complete painting and upholstering in accordance with the buyer's individual wishes.

"Last November we delivered more inclosed bodies than in any month since we started in business. Naturally, we had much complaint of late deliveries because inclosed bodies are in greatest demand during the months of September and October. The trouble was due entirely to the fact that orders were placed too late in the season.

"Orders for inclosed carriages placed in the spring and summer command the choice of delivery dates in the early fall. Under such conditions, patrons may choose from the entire line of body styles, with the opportunity of having every detail of finish and fitting carried out in whatever way their personal taste may direct."

CYLINDER MOTORS IN CUBIC INCHES

	STROKE IN INCHES												
	5	5¼	5½	6	6¼	6½	6¾	6¼	6½	6½	6¾	7	7¼
	165.7	169.3	173.0	176.7	180.4	184.1	187.7	191.4	195.1	198.8	202.5	206.2	209.8
	174.1	177.9	181.8	185.7	189.5	193.4	197.3	201.1	205.0	208.9	212.7	216.6	220.5
	182.7	186.7	190.8	194.8	198.9	202.9	207.0	211.1	215.1	219.2	223.2	227.3	231.4
	191.5	195.7	200.0	204.2	208.5	212.7	217.0	221.2	225.5	229.7	234.0	238.2	242.5
	200.5	204.9	209.3	213.8	218.2	222.7	227.1	231.6	236.0	240.5	245.0	249.4	253.9
	209.7	214.3	219.0	223.7	228.3	233.0	237.6	242.3	247.0	251.6	256.3	260.9	265.6
	219.1	224.0	228.8	233.7	238.6	243.4	248.3	253.2	258.1	262.9	267.8	272.7	277.5
	228.7	233.8	238.9	244.0	249.1	254.1	259.2	264.3	269.4	274.5	279.6	284.6	289.7
	238.5	243.8	249.1	254.4	259.7	265.0	270.3	275.6	280.9	286.2	291.5	296.8	302.1
	248.6	254.1	259.6	265.1	270.7	276.2	281.7	287.2	292.8	298.3	303.8	309.3	314.8
	258.9	264.6	270.4	276.1	281.9	287.6	293.4	299.1	304.9	310.6	316.4	322.2	327.9
	269.3	275.3	281.3	287.3	293.2	299.2	305.2	311.2	317.2	323.2	329.1	335.1	341.1
	280.0	286.2	292.4	298.6	304.8	311.1	317.3	323.5	329.7	335.9	342.2	348.4	354.6
	290.8	297.3	303.8	310.2	316.7	323.2	329.6	336.1	342.6	349.0	355.5	361.9	368.4
	302.0	308.7	315.4	322.1	328.8	335.5	342.2	348.9	355.7	362.4	369.1	375.8	382.5
	313.2	320.2	327.1	334.1	341.1	348.0	355.0	362.0	368.9	375.9	382.8	389.8	396.8
	324.7	331.9	339.2	346.4	353.6	360.8	368.0	375.2	382.4	389.7	396.9	404.1	411.3
	336.4	343.9	351.4	358.8	366.3	373.8	381.3	388.8	396.2	403.7	411.2	418.7	426.1
	348.0	355.7	363.5	371.2	378.9	386.7	394.4	402.1	409.9	417.6	425.3	433.1	440.8
	360.4	368.5	376.5	384.5	392.5	400.5	408.5	416.5	424.5	432.5	440.5	448.6	456.6
	372.8	381 1	389.4	397.6	405.9	414.2	422.5	430.8	439.1	447.3	455.6	463.9	472.2
	385.3	393.8	402.4	411.0	419.5	428.1	436.7	445.2	453.8	462.3	470.9	479.5	488.0
	398.0	406.8	415.7	424.5	433.3	442.2	451.0	459.9	468.7	477.6	486.4	495.3	504.1
	410.9	420.1	429.2	438.3	447.5	456.6	465.7	474.9	484.0	493.1	502.3	511.4	520.5
	424.1	433.5	443.0	452.4	461.8	471.2	480.7	490.1	499.5	508.9	518.4	527.8	537.2
	437.5	447.2	456.9	466.6	476.4	486.1	495.8	505.5	515.3	525.0	534.7	544.4	554.1
	451.0	461.1	471.1	481.1	491.1	501.2	511.2	521.2	531.2	541.2	551.3	561.3	571.3
	464.8	475.1	485.5	495.8	506.1	516.5	526.8	537.1	547.4	557.7	568.1	578.4	588.8
	478.8	489.4	500.1	510.7	521.4	532.0	542.6	553.3	563.9	574.6	585.2	595.8	606.5
	493.0	503.9	514.9	525.8	536.8	547.7	558.7	569.6	580.6	591.5	602.5	613.5	624.4
	507.4	518.6	529.9	541.2	552.5	563.7	575.0	586.3	597.6	608.8	620.1	631.4	642.7
	522.0	533.6	545.2	556.8	568.4	580.0	591.6	603.2	614.8	626.4	638.0	649.6	661.2
	536.8	548.7	560.6	572.5	584.5	596.4	608.3	620.3	632.2	644.1	656.0	668.0	679.9
	551.8	564.0	576.3	588.6	600.8	613.1	625.4	637.6	649.9	662.1	674.4	686.7	698.9
	567.0	579.6	592.2	604.8	617.4	630.0	642.6	655.2	667.8	680.4	693.0	705.6	718.2
	582.4	595.4	608.3	621.3	634.2	647.2	660.1	673.0	686.0	698.9	711.9	724.8	737.8
	598.1	611.4	624.6	637.9	651.2	664.5	677.8	691.1	704.4	717.7	731.0	744.3	757.5
	613.9	627.5	641.2	654.8	668.5	682.1	695.8	709.4	723.0	736.7	750.3	764.0	777.6
	630.0	644.0	658.0	672.0	686.0	700.0	714.0	728.0	742.0	756.0	770.0	784.0	798.0
	646.2	660.6	674.9	689.3	703.7	718.0	732.4	746.7	761.1	775.5	789.8	804.2	818.5
	662.7	677.4	692.1	706.9	721.6	736.3	751.0	765.8	780.5	795.2	810.0	824.7	839.4
	679.4	694.5	709.6	724.6	739.7	754.8	769.9	785.0	800.1	815.2	830.3	845.4	860.5
	696.2	711.7	727.2	742.6	758.1	773.6	789.1	804.5	820.0	835.5	850.9	866.4	881.9
	713.3	729.2	745.0	760.9	776.7	792.6	808.4	824.3	840.1	856.0	871.8	887.7	903.5
	730.6	746.8	763.1	779.3	795.6	811.8	828.0	844.3	860.5	876.7	893.0	909.2	925.4
	748.1	764.7	781.4	798.0	814.6	831.2	847.8	864.5	881.1	897.7	914.4	931.0	947.6
	765.8	782.8	799.9	816.9	833.9	850.9	867.9	884.9	902.0	919.0	936.0	953.0	970.0
	783.7	801.1	818.6	836.0	853.4	870.8	888.2	905.6	923.1	940.5	957.9	975.3	992.7
	801.8	819.7	837.5	855.3	873.1	890.9	908.7	926.6	944.4	962.2	980.0	997.9	1015.6

Delegation of eighty-four White dealers from Iowa making a tour of the White factory in Cleveland

Europe May Have Only One Show

PARIS, FRANCE, Feb. 5—A project is before the International Union of Automobile Mfrs., which comprises the entire automobile trade of Europe, towards the holding of but one European show per annum, this show to be held successively in London, Paris, Berlin, and Brussels. Each of these cities would thus have a show every four years. The proposal was brought before the meeting at its recent session in Brussels, but was merely reported upon, no vote being taken. It is sought by this move to diminish the expenses of manufacturers who are at present obliged to bring out annual models and exhibit them at four or five shows each year. It is impossible, however, for any immediate change to be made, for Berlin, Paris, London and Brussels are pledged to a show at the end of 1914 and in each case have arrangements well in hand. The French manufacturers have long manifested a desire to hold their shows at less frequent intervals, but have never been able to convince English makers of the policy of the move. It is impossible to make any change in this direction until an international agreement has been arrived at.

To Hold Four-Wheel Drive Competition

PARIS, Feb. 5—So much importance is attached by the French army authorities to the four-wheel drive tractor for all military purposes that it has been decided to hold a special competition for these vehicles in addition to the annual trials to determine what trucks are eligible for army subsidies. The trials, which will be held from March 2 to 20, are with a view to direct purchase of four-wheel drive tractors and will be held under very severe conditions approaching as closely as possible to those obtaining in actual warfare. The vehicles will have been on the road 13 days, the daily distances covered varying from 30 to 65 miles. At the end of the trials the vehicles will be entirely dismounted in the artillery shops at Vincennes for a critical inspection.

Plan 2,500-Mile Sociability

DENVER, COL., Feb. 5—A Sociability run of 2,500 miles through six states, to start from Pueblo, Colo., on May 1, is being planned by motorists and good roads promoters from several sections of this state. The purposes of the trip will be to celebrate the opening of the Colorado-to-Gulf highway, to increase the co-operative interest of the people living along the course of the trip, and to advertise the scenic beauties and other touring advantages of Colorado. The Colorado-to-Gulf road and the Santa Fé trail will be followed principally.

Second St. Louis Show Opens

ST. LOUIS, MO., Feb. 7—St. Louis' ninth annual automobile show opened at the Coliseum Monday, February 9, with all the available exhibition space filled. The building decorated with smilax and Florida spring moss, bay trees and flags of all nations and cities was a pretty picture. This is the city's second spring show and many dealers are in the exhibition. The show is the outcome of the barring of dealers from the regular fall show held by the St. Louis Automobile Manufacturers and Dealers' Assn. However, many dealers belonging to the association are exhibitors in this show and this probably will cause much trouble in the future. Fifteen accessories dealers have exhibits. Many dealers who have not entered the show are holding special exhibits at their storerooms as are many dealers in accessories.

Buffalo Truck Show Opens

BUFFALO, N. Y., Feb. 10—Buffalo's advance in the motor truck industry during the past year will be conclusively indicated at the second annual truck exhibition being held here this week in Broadway Auditorium. The annual truck exhibition was opened Monday night by Mayor Fuhrmann. The truck show will last 1 week.

Drought Re-Elected President Wisconsin Assn.

MILWAUKEE, WIS., Feb. 9—James T. Drought was re-elected president of the Wisconsin State Automobile Assn. at the annual meeting of the board of directors in Milwaukee on February 6. Max G. Kusel, of Watertown, was elected first vice-president; Dan O. Head, mayor of Kenosha, second vice-president, and secretary H. A. Appel and treasurer George A. West were re-elected. The new executive committee is: M. C. Moore, chairman; I. G. Hickman, Milwaukee; Dr. E. A. Taylor, Racine; H. L. Halverson, Whitewater, and Percy Eldredge, Oconomowoc. The association has a membership of 1,500 and is affiliated with the American Automobile Assn. President Drought has been a member of the board of directors of A. A. A. for seven years. The executive committee of the Wisconsin association has put under way preliminary arrangements for the conduct of a state reliability tour under grade 1 rules of A. A. A. next July. Three tours have been held, but the run scheduled for 1913 was abandoned when the state and national bodies were unable to agree on rules, and it is expected that this difficulty can be cleared up this year.

E. V. A. A. Appoints Permanent Secretary

NEW YORK CITY, Feb. 9.—The Electric Vehicle Association of America has established a new office, that of permanent executive secretary, to permit the more rapid dispatch of the company's work. A. Jackson Marshall, well-known in the central station field and until recently connected with the General Motors Truck Co., has been appointed to this office. The new permanent headquarters of the association are now at the United Engineering Society's Building, 29 West Thirty-ninth street.

Opens Electric Vehicle Bureau

NEW YORK CITY, Feb. 9—An electric vehicle bureau has been established by the United Electric Light & Power Co., coincidently with the opening of its new generating station at 201st street and the Harlem river. It is planned to co-operate with companies distributing vehicles and their accessories as well as with garages and private owners. To this end transportation and operating data will be collected.

FORD'S CINCINNATI PLANT—An acre and a half at the intersection of Shillito street and the Cincinnati, Lebanon and Northern Railroad, in Walnut Hills, Cincinnati, O., is to be the site of the assembling plant of the Ford Motor Co., Detroit, Mich. While nothing authoritative could be learned it is known that an option has been secured on the property and there is no reason to believe that the acceptance of the proposition is not on the way back to this city. Under the circumstances William Stewart, as receiver for the property of the Enterprise Lumber Co., will undoubtedly take the formal steps for the consummation of the transaction before the end of another week.

Immediately after the veto of the ordinance calling for the vacation of a part of Ridgeway avenue, in Avondale, for the benefit of the Detroit firm, representatives of the factory commenced the negotiations for the Walnut Hills site. Plans showing the location and the advantages of the ground, from a railroad standpoint were prepared and forwarded to Detroit. It is known that the location has met with favor.

Beaver Plant in Gresham—A tract of between 3 and 6 acres in the northwestern part of Gresham, Ore., between the section line road and the Mt. Hood Railway, was purchased during the past week by the Beaver State Motor Co., of Portland, Ore., as a site for its automobile factory. Work will commence immediately.

May Locate in Columbus—Representatives of the Midgely Tire & Rubber Co., organized by Pittsburgh men with a capital of $500,000, met in Columbus, O., to look over prospective sites for the location of their plant. It is understood that the company will locate in Columbus or in Pittsburgh. The company was formed under the laws of West Virginia.

Keystone Plant in Columbus—The Keystone Veh. Co., Columbus, O., which was recently incorporated with a capital of $15,000, will locate a plant on a leased site in the northern part of Columbus. It is planned to do repair work at first and later to manufacture gasoline hearses. According to the charter the company can make all kinds of vehicles.

Wants Metropole Plant—The Business Men's Assn., Middletown, Conn., is endeavoring to induce the Metropole Motors Co., of New York City, to locate in the town. The old Keating plant is well adapted to such an enterprise, as it is well situated and conveniently placed for shipping. Middletown is within easy shipping distance of New York, either by rail or water.

Sandusky Plant Sale, Feb. 24—The sale of the plant and machinery of the Sandusky Auto Parts and Motor Truck Co., of Sandusky, O., bankrupt, has been postponed from February 17 to February 24. The delay is due to the fact that attorneys in the case as yet have been unable to agree on the form of order of sale. This feature has taken so much time that the publication of notice of sale can not be made in order to have the sale on February 17, as was planned.

Agner Co. Adds Improvements—The Raymond C. Agner Co., Burlington, Wis., manufacturing grease and oil guns and other brass accessories and specialties for the motor car trade, has completed improvements to its plant which enables the concern to manufacture all parts of its devices in its own shops. A large power press weighing 12 tons has been installed to produce cylinders for the guns, and an equipment of screw machines and forging and casting machines added to the shops.

Ford's Seattle Plant Dedicated—The Ford Motor Co.'s $250,000 assembling plant building in Seattle, Wash., was formally dedicated with the moving in of the office and service departments. The actual assembling of cars will be begun about February 15. The schedule calls for the production of twenty-five machines each 8-hour working day, or an annual output of 7,000 machines, which will supply the states of Washington, Idaho and Western Montana. This same field in 1913 consumed 4,040 machines.

1,000 Men Want Goodyear Jobs—Over 1,000 men gathered in front of the Goodyear Tire & Rubber Company's employment office, Akron, O., in search of work. The gathering came as a result of the company's announcement to take on 1,600 additional men. The Goodyear plant has not been running up to normal for several months, and its decision to employ more men is taken here as a good sign in the rubber industry.

The Automobile Calendar—Shows, Meetings, Etc.

Feb. 9-14	Seattle, Wash., Annual Automobile Show, State Armory Bldg., W. I. Fitzgerald, Manager.
Feb. 9-14	Buffalo, N. Y., Truck Show, Buffalo Automobile Dealers' Assn.
Feb. 9-14	Grand Rapids, Mich., Fifth Annual Western Michigan Show, Klingman Furniture Exposition Bldg., *Grand Rapids Herald.*
Feb. 9-14	Buffalo, N. Y., Commercial Car Show, Buffalo Automobile Dealers' Assn.
Feb. 9-14	Portland, Me., Second Annual Show, Dealers' Assn.
Feb. 11-14	Geneva, N. Y., Automobile Show, State Armory.
Feb. 11-14	Louisville, Ky., Show, First Reg. Armory, Dealers' Assn.
Feb. 14-21	Pittsburgh, Pa., Automobile Show, Pittsburgh Auto Show Assn.
Feb. 16-22	Kansas City, Mo., Auto Show.
Feb. 16-21	Toronto, Ont., Automobile Show, E. M. Wilcox.
Feb. 17-21	Salt Lake City, Utah, Automobile Show, W. D. Rishel.
Feb. 18-21	Easton, Pa., Automobile Show.
Feb. 18-21	Bloomington, Ill., Automobile Show, McLean County Automobile Club.
Feb. 18-21	Albany, N. Y., Passenger Car Annual Show, State Armory, Albany Auto Dealers' Assn.
Feb. 21	Santa Monica, Cal., Vanderbilt Cup Race.
Feb. 21-28	Newark, N. J., Automobile Show, N. J. Auto Trade Assn.
Feb. 21-28	Cincinnati, O., Automobile Show, Cincinnati Automobile Dealers' Assn.
Feb. 23	Santa Monica, Cal., American Grand Prix.
Feb. 23-25	Albany, N. Y., Commercial Show.
Feb. 23-28	Danville, Ill., Vermillion Co. Auto Show.
Feb. 23-28	Indianapolis, Ind., Auto Show, Indianapolis Auto Trade Assn.
Feb. 23-28	Omaha, Neb., Automobile Show, Omaha Automobile Assn.
Feb. 24-28	Syracuse, N. Y., Automobile Show, State Armory, Syracuse Automobile Dealers' Assn.
March 2-4	Cincinnati, O., Commercial Vehicle Show, Cincinnati Automobile Dealers' Assn.
March 2-7	Sioux City, Ia., Show, New Auditorium Bldg., Sioux City Auto Club Assn.
March 2-7	Utica, N. Y., Show, Automobile Club, W. G. Comstock, Manager.
March 3-7	Fort Dodge, Ia., Show, Fort Dodge Auto Dealers' Assn.
March 3-7	Tiffin, O., Show, *Tiffin Advertiser.*
March 7-14	Hamilton, Ont., Passenger and Truck Show.
March 7-14	Boston, Mass., Automobile Show.
March 9-14	Des Moines, Ia., Show, Des Moines Automobile Dealers' Assn.
March 17-21	Boston, Mass., Truck Show.
April 9-15	Manchester, N. H., Automobile Show.
May 30	Indianapolis, Ind. 500-mile Race, Indianapolis Motor Speedway.
June 24-26	Chicago, Ill., Seventh Annual Meeting of Nat. Gas Engine Assn.
July 3-4	Tacoma, Wash., Road Races, Tacoma Carnival Assn.
July 4	Sioux City, Iowa, 300-mile Race, Sioux City Auto Club and Speedway Assn.
July 4	Lyons, France, French Grand Prix.
July 13-14	Seattle, Wash., Track Races, Seattle Speedway Assn.
July 25-26	Belgium Grand Prix Road Races.
Aug. 28-29	Chicago, Ill., Elgin Road Races, Chicago Automobile Club.
Sept. 9	Corona, Cal., Road Race, Corona Auto Assn.
November	El Paso, Tex., Phoenix Road Race, El Paso Auto Club.

The Week in the Industry

Motor Men in New Roles

KEIP Pacific Coast Chandler Manager—W. S. M. Mead, second vice-president and assistant sales manager of the Chandler M. C. Co., Cleveland, O., was recently in Seattle, Wash., where he closed negotiations with F. B. Keip, formerly manager of the Lozier branch in San Francisco, Cal., to act as coast district manager for the Chandler company. Mr. Mead will return East by way of California.

Gifford Resigns—E. A. Gifford has resigned from the International Harvester Corp., Chicago, Ill.

Perkins Overman Tire Manager—E. R. Perkins has succeeded Theodore Reynolds as general manager of the Overman Tire Co., New York City.

Patchen Standard Car Manager—S. F. Patchen is the new branch manager of the Standard Mfg. Co., Cleveland, O., succeeding Don Craft, who recently resigned.

Bernhart Resigns from Atlas Co.—O. P. Bernhart has resigned as general manager of the Atlas Mfg. Co., Fostoria, O., to take a position with the Auto Crank Shaft Co., Detroit, Mich.

Now with the Mitchell—R. D. Whitney has joined the Lawrence-Stanley Co., of Boston, Mass., agent for the Mitchell and he will travel through the New England territory for the company.

President of Hartford Chamber of Commerce—C. B. Whittlesey, manager of the Hartford Rubber Works Co., Hartford, Conn., has been elected president of the Hartford Chamber of Commerce.

Springfield Branch Open—Day Baker, New England manager of the General Vehicle Company, has appointed Preston T. Miller manager of the new branch recently opened in Springfield, Mass., at 327 Main street.

Kelly Succeeds Alvin—Moore Kelly has been appointed manager of the Detroit, Mich., branch of Kokomo Electric Co., and the Kokomo Electric Co., Kokomo, Ind. He will succeed F. J. Alvin, who recently resigned.

Resigns from Co.—Al Spear has resigned from the Spear Auto Co., one of the big Portland, Me., agencies, that he formed several years ago. He has sold his interest to L. A. Peterson, one of his associates in the company.

Clark Resigns—C. H. Clark, advertising manager of the Goulds Mfg. Co., Seneca Falls, N. Y., has resigned to accept a position with Robbins & Myer, manufacturers of motors and electrical supplies in Springfield, O.

Scheu Resigns from Invader Oil—General Sales Manager Scheu, of the Invader Oil Co., has resigned from that company to join the Euclid Cycle-Light Car Co., New York City, which is shortly to launch an extensive cyclecar enterprise.

Firestone Visiting West—R. J. Firestone, sales manager of the Firestone Tire & Rubber Co., Akron, O., is touring the western cities. Practically every city west of the Mississippi will be visited by him for the purpose of preparing for the spring trade.

Van Wagenen Dies—F. D. Van Wagenen, for the past 8 years, president of the F. D. Van Wagenen Co., Inc., conducting a general automobile and vehicle business, expired on February 3 at his home in Fulton, N. Y., following a brief illness.

Holmes Herreshoff Cyclecar Manager—Northrup Holmes, president of the Herreshoff Motor Co., Troy, N. Y., will supervise the production of the Herreshoff cyclecar. He has assumed the position of general manager of the factory at Troy, where the cyclecar is to be made.

Kendall in New Role—Roy Kendall, formerly manager of the factory branch of the Mercer company in Kansas City, Mo., is now in charge of the city business of the Bond Motor Co., selling the Maxwell and the Oldsmobile. The Mercer branch was discontinued there several months ago.

Little Resigns—W. C. Little has resigned as advertising manager of the Borland-Grannis Co., of Chicago, Ill. He was formerly assistant to C. A. Emise, sales manager of the Lozier Motor Co., Detroit, Mich., and before that was special representative of the Rauch & Lang Co., Cleveland, O.

Dudley with Standard Machinery Co.—A. J. Dudley, recently a member of the engineering and designing staff of the Kissel M. C. Co., Hartford, Wis., has resigned to become a member of the Standard Machinery Co., Schlesingerville, Wis., manufacturing gasoline engines. He will assist in the engineering department and also act as general sales and traveling representative.

Braden in New Company—J. A. Braden, who was two years ago a victim of a nervous breakdown, after many years as advertising manager of the former Diamond Rubber Co., Akron, O., and who since his recovery, has been in charge of the advertising of the Northern Ohio Traction & Light Co., has been appointed general passenger agent of that company's electric railway lines.

McIntyre Joins Stutz—A. H. McIntyre, well known as an oil salesman, has joined the New England agency for the Stutz at Boston and will travel through the Northern portion of the territory for the company. Another addition to the company recently is L. H. Bradstreet, formerly prominent in Maine automobile circles, who has purchased an interest in the New England Stutz agency.

McCusker Leaves for Locomobile Factory—Owen McCusker, Jr., manager of the Seattle branch of the Locomobile Co. of America, recently left for the Locomobile factory at Bridgeport, Conn. He will join the manager of the Frisco, Oakland and Los Angeles branches in California, and the quartet will make the transcontinental journey in a group. The occasion of their trip to Bridgeport is the annual gathering of Locomobile branch managers.

Measure Retires in Boston—Alfred Measure, for some years manager of the Boston agency for the Cadillac cars has retired from the position. His health has not been well and he took a trip to Panama recently, returning to Boston a few days ago. He is succeeded by A. L. Danforth, who until recently was manager of the used car department of the Alvan T. Fuller Company, agents for the Packard.

Lloyd in Charge Fisher Motor—R. McA. Lloyd, who was formerly assistant to the president of the General Vehicle Co., and later connected with the International Motor, now representing the Fisher Motor Corp., New York City, has assumed charge of its affairs. As the successor to the Motor & Gear Improvement Co., which lately passed out of existence, the Fisher corporation is sole American concessionary for its group of patents.

Detroit Pressed Steel Changes—Several changes were made in the offices of the Detroit Pressed Steel Co., Detroit, Mich., at its recent annual meeting. The following officers were elected for the coming year: H. P. Hoyt, president; E. P. Caulkins, secretary and treasurer; and Carl Flinterman, vice-president and general manager. A. H. Zacharias, formerly president and general manager, has severed his connection with the company.

Yerkes Heads Stearns-Moon Philadelphia Branch—The Philadelphia, Pa., Stearns and the Moon car interests have been consolidated. W. C. Yerkes will head his branch, which is now called the Stearns Motors Co. The personnel of the new company remains the same as that of the F. B. Stearns Co., of Philadelphia, which it supplants. Simultaneously with the announcement that the Stearns interests had been transferred was the further announcement that the business of the Minerva Motors Co., handling the Moon cars, will be removed to the Stearns headquarters, 245 North Broad street. Mr. Yerkes was until now the general manager of the Minerva company.

Garage and Dealers' Field

Zenith Carburetors on Foreign Cars—At the recent Importers' Salon at the Astor Hotel, New York City, thirteen foreign makes displayed sixty-one cars, twenty-seven of which were equipped with Zenith carburetors.

Roberts Secures Quarters—Frank L. Roberts, who has just taken the Velie agency for Boston and vicinity, has moved into the building on Newbury street occupied by the White Company until it moved to its new place on Commonwealth avenue. It is being remodeled so that there will be large salesrooms on the lower floor.

Recent Incorporations in the Automobile Field

AUTOMOBILES AND PARTS

BUFFALO, N. Y.—Buffalo Cyclecar Corp.; capital, $5,000; to deal in cyclecars. Incorporators: C. B. Porter, T. W. Hammond, W. C. Newcomb.

CHICAGO, ILL.—Chicago Rayfield Motor Sales Co., capital, $10,000; to manufacture automobiles. Incorporators: J. C. Krafft, J. H. Krafft, W. A. Krafft.

CHICAGO, ILL.—Commerce M. C. Co.; capital, $5,000; to deal in automobiles. Incorporators: A. W. De Latour, Ellias Mayer, Charles Rudolph.

CHICAGO, ILL.—M. S. Motor Co.; capital, $20,000; to deal in automobiles. Incorporators: E. A. Biggs, W. R. Fetzer, J. Rigney.

CHICAGO, ILL.—Puritan Motor Co.; capital, $2,500; to deal in autos. Incorporators: S. C. Larson, A. E. Nelson, S. T. Johnson.

CINCINNATI, O.—Jay County Auto Co.; capital, $6,000; to deal in automobiles. Incorporators: H. L. Norris, O. E. Shafer, A. P. Grimes.

CLEVELAND, O.—Brasher M. C. Co.; capital, $10,000; to deal in automobiles. Incorporators: L. A. Brasher, E. G. Dillow, H. B. Walker, A. J. Hatch, G. D. Armstrong.

CLEVELAND, O.—Petro Automobile Co.; capital, $1,000; to deal in automobiles. Incorporators: J. J. Petro, A. J. Moltka, Jos. Chevrovski, Henry Petro, John Petro.

COLUMBIA, S. C.—DuPre Automobile Co.; capital, $15,000; to deal in automobiles. Incorporators: E. M. DuPre, M. J. McCols.

COLUMBUS, O.—O'Neil Auto Livery Co.; capital $15,000; to deal in automobiles. Incorporators: C. A. Weinman, J. A. Connor, Sam Graff, E. C. O'Neil, J. J. Hogan.

CORNING, N. Y.—Steuben Ford Co.; capital, $1,000; to deal in automobiles. Incorporators: W. P. Zwilling, A. M. Zwilling, Peter Knobloch.

DETROIT, MICH.—Alter M. C. Co.; capital, $10,000; to deal in automobiles. Incorporators: R. A. Skinee, Guy Hamilton, Clarence Alter, F. M. Woodward.

KANSAS CITY, MO.—Western Motor Co.; capital, $15,000; to deal in automobiles. Incorporators: John Scripps, F. C. Bader, Asher C. Jones.

LAKE PLACID, N. Y.—J. B. Williams Co.; capital $5,000; to deal in automobiles. Incorporators: J. B. Williams, F. S. Leonard, J. P. Crowley.

NEW YORK CITY—Boulevard Renting Co.; capital, $5,000; to deal in motors, etc. Incorporators: Fred. Mastin, Margaret Just, F. R. Scoppa.

NEW YORK CITY—Colonial Motor Sales Co.; capital, $2,500; to deal in automobiles. Incorporators: Hyman Rosenson, Ray Rosenson, Robert Lynch.

NEW YORK CITY—Ford Owners' Service Corp.; capital, $25,000; to deal in automobiles. Incorporators: F. A. Williams, F. C. Cimons, C. Weiss.

NEW YORK CITY—G. L. Sullivan; capital, $50,000; to deal in automobiles. Incorporators: G. L. Sullivan, E. H. Gilley, J. F. Russell, Jr.

NEW YORK CITY—Ohio Eastern Distributors; capital, $2,000; to deal in automobiles. Incorporators: G. S. Bradt, N. R. Bradt, C. A. Luff.

NEW YORK CITY—Pelham Motors Co.; capital, $100,000; to manufacture and deal in automobiles. Incorporators: H. R. Callisen, F. H. Page, K. A. Siemers.

NORFOLK, VA.—People's M. C. Co.; capital, $20,000. Incorporator: J. A. Barker.

NEW YORK CITY—Pete Reidenbach Wagon Works; capital, $10,000; to build auto bodies. Incorporators: Margaretha Reidenbach, Susanna Reidenbach, G. C. Reidenbach.

NEW YORK CITY—Thomey Auto Service; capital, $1,000; to deal in automobiles. Incorporators: Eugene Thomey, Fred Thomey, Harry Abraham.

NEW YORK CITY—Phila. Motor-Mart Co.; capital, $3,000; to deal in automobiles. Incorporators: John Gerosa, Sam. Tullman, Lillian Stimelsky.

OMAHO, NEB.—Lincoln Highway Automobile Co.; capital, $2,500; to deal in automobiles. Incorporators: William Havelka, Steve Cuhel.

PHILADELPHIA, PA.—Superior Motor Supply Co. capital, $250,000; to buy and deal in automobiles. Incorporators: G. H. B. Martin, S. C. Seymour.

PATERSON, N. J.—Auto Tire & Supply Co.; capital, $50,000; general automobile business. Incorporators: G. J. Giger, W. W. Evans, A. G. Scholer.

PHILADELPHIA, PA.—Superior Motor Specialty Co.; capital, $250,000; to manufacture and sell automobiles. Incorporators: F. R. Hansell, G. H. B. Marin, S. C. Seymour.

PLAINFIELD, N. J.—E. & C. Auto Sales Co.; capital, $25,000; general automobile business. Incorporators: F. Endress, E. A. Craig, L. A. Endress.

PORT JERVIS, N. Y.—Taynton Auto Co.; capital, $1,000; to deal in automobiles. Incorporators: F. N. Mason, J. D. Swinton, V. W. Taynton.

SPRINGFIELD, MASS.—J. G. Riga & Sons Co.; capital, $25,000; to manufacture automobiles. Incorporators: J. G. Riga, H. M. Riga, J. C. Riga.

SPRINGFIELD, O.—Motor Mart Co. of Springfield; capital, $25,000; to deal in automobiles. Incorporators: G. B. Swope, C. W. Fritz, Sr.; J. H. Lawill, J. A. Foss, M. R. Weikart.

ST. LOUIS, MO.—Wasmann & Miller Automobile Co.; capital, $2,000; to deal in automobiles. Incorporators: Elmer Wasmann, Tony Miller, May Miller.

WELLSPORT, N. Y.—Whitwood Corp.; capital, $25,000; to manufacture motor trucks. Incorporators: C. E. Whitwood, C. S. Caywood, T. M. Osborne.

WILMINGTON, DEL.—Keller Cyclecar Corp.; capital, $250,000; to manufacture cyclecars. Incorporators: H. E. Latter, W. J. Maloney, O. J. Reichard.

YONKERS, N. Y.—W. A. Shanahan-Thompson Corp.; capital, $3,000; to deal in motors. Incorporators: W. A. Shannan, A. S. Thompson, A. C. Travis.

YORKLYN, DEL.—Diamond State Automobile Co.; capital, $25,000; to deal in automobiles. Incorporators: Thomas Clarke Marshall, N. B. Mancell, J. F. Chapple.

GARAGES AND ACCESSORIES

BROOKLYN, N. Y.—Renault Tire & Rubber Co.; capital, $25,000; to deal in automobile tires. Incorporators: Max Hillman, D. M. Hanley, Harry Baumstone.

BROOKLYN, N. Y.—Rodney Garage Co.; capital, $1,000; C. C. Simpson, Natalie Simpson, H. W. Simpson.

CHICAGO, ILL.—Crown Auto Livery Co.; capital, $2,500; operate an auto livery. Incorporators: W. A. Jones, Joseph Rothstein, L. F. Jacobson.

CHICAGO, ILL.—Sheridan Vulcanizing and Tire Co.; capital, $5,000; to repair and deal in tires. Incorporators: D. F. Ryan, L. F. Phillips, Percival Steele.

CLEVELAND, O.—Neil Automobile Livery Co.; capital, $15,000; to carry on a general automobile livery business. Incorporators: C. A. Weinman, J. J. Hogan, J. A. Conner.

CORNWALL-ON-HUDSON, N. Y.—Storm King Garage; capital, $1,000; general garage business. Incorporators: James Lewis, E. C. Townsend, William Wells.

LOUISVILLE, KY.—Dixie Auto Supply Co.; capital, $6,000; to deal in accessories. Incorporators: A. H. Drake, Herman Jansen, J. A. Kolb, Sr.

NEW YORK CITY—Associated Garages; capital, $110,000; general garage business. Incorporators: L. B. Lothrop, E. T. Levey, H. A. Alexander.

NEW YORK CITY—Auto Signalite Export Co.; capital, $10,000; patented auto devices. Incorporators: A. L. Incoffs, A. E. Gunn, Henry Donovan.

NEW YORK CITY—Bosch Auto Exchange; capital, $20,000; to deal in spark plugs. Incorporators: Max Frieder, E. D. Dietz, J. J. Pheelan.

NEW YORK CITY—Bronx Rubber & Auto Specialty Co.; capital, $4,000; to deal in tires and auto supplies. Incorporators: Josephine Mulholland, J. A. Mulholland, S. J. Mulholland.

NEW YORK CITY—Dinshah Engine Tester Corp.; capital, $50,000; to manufacture and deal in automobile engine testers, a patented device. Incorporators: J. P. Welsh, P. M. Richards, D. P. Ghabiali.

NEW YORK CITY—Harlem Taxi Co.; capital, $600; to carry on a general taxicab business. Incorporators: Gobie Reich, R. S. Schwartz, Edw. Goldstein.

MEMPHIS, TENN.—Gay Streibich Auto Wheel Co.; capital, $125,000; to manufacture a patent automobile wheel. Incorporators: G. R. Gay, F. O. Rogers, Frank Wittenberg.

NEW YORK CITY—Heliz Tube Co.; capital, $250,000; to manufacture and deal in auto tires and accessories. Incorporators: G. D. Howard, C. S. Houghton, J. D. Gabler.

NEW YORK CITY—Lubricator Corp.; capital, $100,000; to manufacture lubricators for motors, engines, etc. Incorporators: L. R. Blach, D. C. Thomas, W. C. Ottiwell.

NEW YORK CITY—Model Garage Co.; capital, $1,000; general garage business. Incorporators: Buonaventura Saso, Robario Saso, John Saso.

NEW YORK CITY—National Spoke & Nipple Co.; capital, $25,000; to manufacture spokes and nipples for use in the manufacture of wheels for automobiles. Incorporators: J. M. Satterfield, W. P. Carrow, M. M. Hirons.

NORFOLK, VA.—Old Dominion Tire Corp.; capital, $10,000; to manufacture automobile tires. Incorporators: J. E. Guy, B. S. Joynes.

NEW YORK CITY—Olin Giberson & Lowy; capital, $5,000; to manufacture steel balls, ball bearings, automobile accessories. Incorporators: J. S. Sherman, Philip Lindsley.

NEW YORK CITY—Quick Charge Storage Battery Co.; capital, $500,000; to manufacture storage batteries. Incorporators: S. C. Sabel, Russel Law. Leslie Reid.

NEW YORK CITY—United Automobile Racing Assn.; capital, $5,000; to conduct an association for automobile racing. Incorporators: L. M. Marks, Alfred Marks, O. V. Matthews.

NEW YORK CITY—127th Street Garage Co.; capital, $5,000; general garage business. Incorporators: W. F. Bullman, G. M. Stevens, H. L. Holly.

SYRACUSE, N. Y.—Elasto Co.; capital, $30,000; to manufacture and deal in compounds for use in tires, etc.—Incorporators: J. G. Ellenot, A. T. Bradley, H. C. Kennedy.

TOLEDO, O.—Collingwood Garage Co.; capital, $10,000; general taxicab business. Incorporators: Carl Lemster, O. L. Rankinson, K. S. Lemster, Bert Decker, C. L. Deeds.

TOLEDO, O.—Knight Rubber Co.; capital, $10,000; to deal in automobile tires. Incorporators: O. E. Starr, T. J. Harris.

CHANGES OF NAME AND CAPITAL

BOSTON, MASS.—W. A. & J. C. Haartz; change of name to J. C. Haartz, Inc.

CLEVELAND, O.—National Garage Co.; capital increased from $60,000 to $100,000.

New Agencies for Trucks and Cyclecars

COMMERCIAL VEHICLES

Admire, Kan.	Kelly	Lyons-Orchard Co.
Boston, Mass.	Jeffery	C. P. Rockwell, Inc.
Cambridge, Mass.	Parcel Post	Parcel Post Equip. Co.
Kansas City, Kan.	Kelly	Motor Sales Co.
Kansas City, Mo.	Chase	C. E. Rouze Motor Co.
Kansas City, Mo.	Mack-Saurer	C. E. Rouze Motor Co.
Kansas City, Mo.	Monitor	Rode Bros.
Louisville, Ky.	Federal	Leyman Motor Co.
Milwaukee, Wis.	Menominee	Auto Truck Service Co.
Minneapolis, Minn.	Motokart	C. & S. Co.
Montreal, Que.	Lauth-Juergens	Leger & St. Pierre.
Montreal, Que.	Thornycroft	Gadbois, Ltd.
Ottawa, Ont.	Indiana	The Capitol Storage Co.
Philadelphia, Pa.	Koehler	D. W. Harper.
St. Louis, Mo.	Republic	Paine Auto Co.
St. John, N. B.	Thornycroft	Maritime M. C. Co.
St. Joseph, Mo.	Kelly	Eads Auto Co.
Tipton, Kan.	Kelly	Merger & Corpstein.
Toledo, O.	Lauth-Juergens	L. W. Morris.
Topeka, Kan.	Kelly	I. F. Billings Auto Co.
Tulsa, Okla.	Kelly	New State Auto & Sup. Co.

CYCLECARS

Atlanta, Ga.	Imp.	Southern Imp Cyclecar Co.
Boston, Mass.	Imp.	E. P. Blake.
Buffalo, N. Y.	Imp.	Ralph Brown Motor Car Co
Cedar Rapids, Ia.	Imp.	John Francis
Chicago, Ill.	Imp.	H. O. Pence.
Chicago, Ill.	Imp.	Paul Wargny Co.
Cleveland, O.	Imp.	Wilkinson Cyclecar Co.
Columbus, O.	Imp.	Mercer Auto Sales Co.
Costa Rica, Cent. Amer.	Imp.	John N. Bliss.
Denver, Col.	Imp.	Imp Cyclecar Co.
Grand Rapids, Mich.	Imp.	Glen H. Downs.
Honolulu, Hawaii	Imp.	Volcano Stables & Tran. Co.
Kalamazoo, Mich.	Imp.	F. W. Kanley Co.
Kansas City, Mo.	Imp.	Motor Cycle & Sales Co.
Lima, O.	Imp.	Lima Cyclecar Co.
Los Angeles, Cal.	Western Cyclecar	Carl Christensen M. C. Co.
Maplewood, N. J.	Imp.	N. C. Fairchild.
Manila, P. I.	Imp.	Amer. Hdw. & Plumb. Co.
Minneapolis, Minn.	American Cyclecar	LaCrosse Auto Co.
Milwaukee, Wis.	Imp.	Cyclecar Sales Co.
Minneapolis, Minn.	Imp.	Martin Motor Sales Co.

New Agencies for Passenger Vehicles

PLEASURE VEHICLES

Addison, N. Y.	Maxwell	L. J. Haynes.
Adrian, Mich.	Maxwell	Benj. Blain
Adel, Ia.	Maxwell	Alsire Auto Co.
Albion, Mich.	Maxwell	Albion Garage.
Anaconda, Mont.	Maxwell	Chas. Branscombe.
Atchison, Kan.	Reo	M. J. Norman & Co.
Augolia, N. Y.	Maxwell	B. I. Hartshorn.
Augusta, Ky.	Case	J. R. Carter.
Aurora, Neb.	Oakland	Hockenbary Auto Co.
Bardstown, Ky.	Case	J. R. Grigsby & Sons.
Barry, Ill.	Maxwell	Keller & Wike.
Belden, Neb.	Maxwell	Mitchell & Griesel.
Beloit, Kan.	King	J. E. Baird.
Bellefontaine, O.	Maxwell	J. E. Hornberger.
Big Rapids, Mich.	Maxwell	Ferris & Bishop.
Bloomfield, Ia.	Maxwell	Harter & Vorhis.
Bloomington, Ill.	Herff-Brooks	Trott & Stubblefield.
Bolcklow, Mo.	Chevrolet	Randleman & Johnson.
Bonaparte, Ia.	Maxwell	C. O. Meredith.
Bowling Green, Ky.	Case	Warren Co. Hdw. Co.
Bosworth, Mo.	Chevrolet	Cabble & Young.
Brookfield, Mo.		C. Carpenter.
Bucyrus, O.	Ford	A. L. Holloway.
Bucyrus, O.	Studebaker	H. A. Paxton.
Bussey, Ia.	Maxwell	Koen Verrips.
Canarraga, N. Y.	Maxwell	A. F. E. Mihlenbacher.
Carlock, Ill.	Marathon	Brenneman & Dry.
Carrollton, Ky.	Case	C. Deweese.
Carthage, Mo.	Chevrolet	Lampher Car'ge & Auto Co.
Centerville, S. D.	Oakland	C. H. Johnson.
Chester, Ill.	Metz	Hersbach Bros.
Chicago, Ill.	Herff-Brooks	Chic. Gt. West. M. C. Co.
Cleveland, O.	Allen	Brown & Davis.
Clinton, Mich.	Maxwell	Clinton Garage.
Clinton, Mo.	Hupmobile	C. H. Pearson.
Columbus, O.	Jeffery	Central Auto Veh. Co.
Columbus, O.	Velie	Spring Street Garage.
Columbus, O.	Allen	Snyder Auto Co.
Columbus, O.	Detroiter	McCarty & Wells.
Columbus Junction, Ia.	Maxwell	Col. Junction Motor Co.
Columbus, O.	Ohio-Royal	Craighead Motor Sales Co.
Compton, Cal.	Maxwell	H. A. Chaffee.
Conrad, Ia.	Maxwell	J. W. Rourke.
Conroy, Ia.	Maxwell	Geiger & Markinson.
Covington, Ky.	Maxwell	Covington Auto Co.
Cripple Creek, Col.	Hupmobile	E. J. Williams.
Cuthbert, Ga.	Maxwell	J. V. Boyett.
Cynthiana, Ky.	Case	Williams & Giles.
Dallas, Ia.	Maxwell	Cleveland & Burnell.
Dalton, Mass.	Maxwell	H. F. Shaw.
Dayton, O.	Franklin	F. B. Heathman Motor Co.
Deer Creek, Okla.	Chevrolet	C. F. Eberle & Co.
Delta, Ia.	Maxwell	Hatcher Bros.
Denver, Mo.	King	Bram Bros.
Denver, Col.	Moon	B. F. Vreeland.
Des Moines, Ia.	Herff-Brooks	Means Auto Co.
Dewey, Okla.	King	Pope Garage Co.
Dinuba, Cal.	Maxwell	Dustan & Begg.
Douglas, Neb.	Oakland	F. B. Enyart.
Electra, Tex.	Maxwell	L. L. Donnell.
Elk Point, S. D.	Oakland	A. H. Ringsrud.
Enumclaw, Wash.	Maxwell	Enumclam Rochdale Co.
Erhart, O.	Maxwell	G. F. Gross & Co.
Etiwanda, Cal.	Maxwell	Frost Bros.
Everett, Wash.	Maxwell	Hilzinger Motor Co.
Fairmount, Ill.	Franklin	Franklin Car Co.
Forest, O.	Maxwell	N. J. Elder.
Fort Bragg, Cal.	Maxwell	C. A. Norberry.
Fort Madison, Ia.	Herreshoff	R. F. Racey.
Fulton, Ky.	Rambler	I. H. Read.
Gallatin, Mo.	Reo	I. P. Miller.
Glenwood, Ia.	Oakland	Fred. Seeger.
Hamilton, Mo.	Reo	G. N. Haynie.
Hanover, Pa.	Herff-Brooks	D. B. Lau.
Harrisonville, Mo.	Hupmobile	W. D. Russell.
Haxtum, Col.	Maxwell	Peterson Bros.
Hays, Kan.	Hupmobile	E. H. Middlekauff.
Higginsville, Mo.	Hupmobile	Mueller-Rehkon.
Holdrege, Neb.	Oakland	Western M. C. Co.
Holland, Ia.	Maxwell	I. D. Dieken.
Holstein, Ia.	Maxwell	Henry Schneckcloth.
Hopkins, Mo.	Oakland	Geo. Ulmer.
Hopkinsville, Ky.	Case	Sam Metcalf.
Houstonia, Mo.	Reo	Voigt Bros.
Independence, Kan.	King	Chaney & Passauer.
Iron Mountain, Mich.	Maxwell	John Obermeyer.
Jackson, Mich.	Maxwell	T. J. Moon & Co.
Jasper, Tenn.	Hupmobile	A. R. Pryor.
Kansas City, Mo.	Buick	Hiatt Motor Co.
Kansas City, Mo.	Marathon	Marathon Auto Sales Co.
Kenton, O.	Maxwell	J. W. Reddock.
Keystone, Ia.	Maxwell	Miller & Shreeves.
La Center, Ky.	Maxwell	Holland & Frazier.
La Coste, Tex.	Maxwell	George Christillis & Sons
Lamar, Mo.	Reo	A. M. CcCrea & Co.
Lancaster, Ky.	Case	J. R. Mount & Co.
Lansdowne, Pa.	Hupmobile	C. A. Simons.
Laurens, Ia.	Hupmobile	V. A. Noble.
Leland, N. D.	Maxwell	John Kloudt.
Le Mars, Ia.	Oakland	Plymouth Auto Co.
Lexington, Ky.	Rambler	C. O. Updike.
Lexington, Mo.	Reo	Santa Fe Trail Garage Co.
Livingston, Wis.	Maxwell	Gunlach & Carter.
London, O.	Overland	London Auto Inn.
Lorain, O.	Maxwell	F. F. Burrer.
Madison, Minn.	Hupmobile	Martin Hanson.
Madison, Mo.	Marathon	LeRoy Haden.
Manchester, N. H.	Herff-Brooks	H. L. Lamprey.
Mansfield, O.	Maxwell	Richland M. C. Co.
Marissa, Ill.	Regal	Henry Finger.
Martelle, Ia.	Maxwell	Martin & Son.
Martinsville, Ill.	Maxwell	Martinsville Auto Co.
Mechanicsburg, O.	Hudson	Culbertson Bros.
Mechanicsville, Ia.	Maxwell	Bock, Kohl & Dewald.
Mesa, Ariz.	Overland	Worth Bellamy.
Millersburg, Ia.	Maxwell	Seaton Bros.
Millersburg, Ky.	Case	E. B. Taylor.
Millersburg, O.	Maxwell	C. L. Godfield.
Minneapolis, Kan.	Reo	L. A. Smith.
Minneapolis, Minn.	Ford	Charles Wilber.
Minneapolis, Minn.	Glide	Lacrosse Auto Co.
Minneapolis, Minn.	Herff-Brooks	Lacrosse Auto Co.
Modesto, Cal.	Maxwell	H. Benson.
Montreal, Que.	Arrol Johnston	Albion M. C. Co.
Montreal, Que.	Franklin	Hector Grothe.
Montreal, Que.	Oakland	Leger & St. Pierre.
Montreal, Que.	Wolsely	R. B. Timberlake.
Narrowsburg, N. Y.	Maxwell	S. B. Dexter.
Natoma, Kan.	Maxwell	A. H. Krueger.
New Franklin, Mo.	Chevrolet	Carson & Wayland.
Newport, Ky.	Oakland	Newport Livery & Gar. Co.
New Lexington, O.	Buick	C. C. Dillow & Son.
New Windsor, Ill.	Maxwell	Sanquist & Bushfield.
North Middletown, Ky.	Oakland	Dr. G. A. Cook.
Ogdensburg, N. Y.	Maxwell	Henry Robson.
Olympia, Wash.	Maxwell	E. C. Tew.
Orange City, Ia.	Oakland	A. Vander Welt.
Oskaloosa, Ia.	Maxwell	Central Garage & Repair Co.
Oswego, Kan.	King	J. F. Dean.
Ottumwa, Ia.	Maxwell	Snow Auto Co.
Owensboro, Ky.	Case	Jesse & Forgy.
Palmer, Ia.	Maxwell	Olson & Schroeder.
Paris, Ky.	Case	Redmon Bros.
Paterson, N. J.	Hupmobile	Edwards & Yule.
Paynes, O.	Maxwell	S. D. Nevland.
Peekskill, N. Y.	Herreshoff	Peekskill Garage.
Perry, N. Y.	Maxwell	Frank Eaton.
Peoria, Ill.	Marathon	Griswold & Edmondson.
Peru, Ind.	Maxwell	J. R. Miller.
Phœnix, Ariz.	Hudson	Oscar Irvin.
Phœnix, Ariz.	Stutz	Ottestad & Weld.
Pierce, Neb.	Oakland	W. F. Lierman.
Plymouth, Neb.	Oakland	Nispel & Metcalf.
Ponca, Neb.	Oakland	F. E. Adams.
Portland, Ore.	King	T. A. Riggs.
Port Washington, Wis.	Maxwell	W. F. Wilke.
Princeton, Mo.	Reo	F. A. Lambert.
Princeville, Ore.	Hupmobile	O. G. Adams.
Pueblo, Col.	Moon	H. H. Lundy.
Pulaski, Ia.	Maxwell	E. J. Hootman.
Redding, Cal.	Maxwell	Adolph Bystle.
Red Oak, Ia.	Oakland	Haas & Milledge.
Remsen, Ia.	Maxwell	Speicker Bros.
Ridgeway, Mo.	King	R. A. Curtis.
Ripon, Cal.	Maxwell	I. A. Goodwin.
River Falls, Wis.	Maxwell	I. O. Isaacson.
Rockford, Ill.	Herreshoff	W. J. Graham.
Rockport, Ill.	Maxwell	Haines-Rupert Co.
Royal, Ia.	Maxwell	L. J. Hyelm.
Rushville, Ill.	Herff-Brooks	Matthews Bros.
Rutland, Vt.	Herreshoff	J. E. Holmes.
Sac City, Ia.	Oakland	Pearson Auto Co.
San Simon, Ariz.	Maxwell	G. V. Copp.
Santa Paula, Cal.	Maxwell	A. A. Hanna.
Seattle, Wash.	Case	E. J. Jaeger & Co.
Seattle, Wash.	Haynes	Haynes Sales Agency.
Seattle, Wash.	Haynes	N. J. Morehouse.
Sheldon, Ia.	Maxwell	De Motz & Duistemare.
Shelby, Neb.	Oakland	Kinney Auto Co.
Shickley, Neb.	Oakland	Thos. McElroy.
Sibley, Ia.	Maxwell	Pulscher Eilders & Co.
Sinton, Tex.	Maxwell	McWhorter Bros.
Slater, Mo.	Reo	A. L. Lucas.
Soldier, Ia.	Oakland	Boe & Uhling.
Somerville, Mass.	Marathon	Ryan & Soracio.
Springfield, Mo.	King	H. E. Seeley.
Stanberry, Mo.	King	Welch & Enyart.
St. Joseph, Mich.	Herreshoff	Millard Lucker.
St. Joseph, Mo.	King	H. Kimmet.
Sturgis, S. D.	Oakland	M. R. Dobbins.
Sunny Hill, Ill.	Maxwell	A. Lawson.
Tenino, Wash.	Maxwell	L. J. Johnson.
Tiffin, O.	Maxwell	J. A. Manecke.
Trenton, Mo.	Reo	A. Frake.
Trion, S. D.	Oakland	Gied, Case & Nagel.
Tuolumne, Cal.	Oakland	Gibbs & Speaker.
Verdigre, Neb.	Maxwell	Jackminek & Son.
Vernon, Tex.	Maxwell	A. C. Bager.
Vinton, O.	Maxwell	Andrews Mathews Auto Agency.
Walker, Ia.	Maxwell	Barry & Cooper.
Warwick, Md.	Maxwell	R. B. Merritt & Son.
Washington, Ia.	Maxwell	M. C. Kyle.
Watertown, N. Y.	Haynes	J. M. Weeks.
Watertown, S. D.	Maxwell	Klix & Stamocher.
Watertown, S. D.	Maxwell	Hanten Machine Co.
Water Valley, Miss.	Oakland	W. T. Trusty.
Wauneta, Neb.	Oakland	C. E. Johnson.
Wayne, Neb.	Maxwell	Grothe & Marsteller.
Wenatchee, Wash.	Maxwell	Warren's Garage.
Wentzville, Mo.	Maxwell	Boehl & Thiemann.
West Point, Neb.	Maxwell	Kerkow & Ickman.
Wilkes-Barre, Pa.	Maxwell	Robert Johnston.
Williamstown, Ky.	Maxwell	O. P. Elliston.
Williamstown, Mo.	Maxwell	W. T. Ragan.
Willow, Cal.	Maxwell	Glenn Co. Garage.
Wilmont, Minn.	Maxwell	Wilmont Auto Co.
Winchester, Ky.	Case	People's Motor Co.
Windber, Pa.	Herreshoff	Commer & Shafer.
Winfield, Kan.	King	A. E. Hudson.
Winfield, Mass.	Oakland	Hutchinson-Richardson Auto & Realty Co.
Winnipeg, Can.	Franklin	Franklin Motor Car Co.
Wolbach, Neb.	Oakland	W. R. Peck.
Woodland, Wash.	Maxwell	T. E. Oliver.
Woodville, Wis.	Maxwell	J. B. Jacobson.